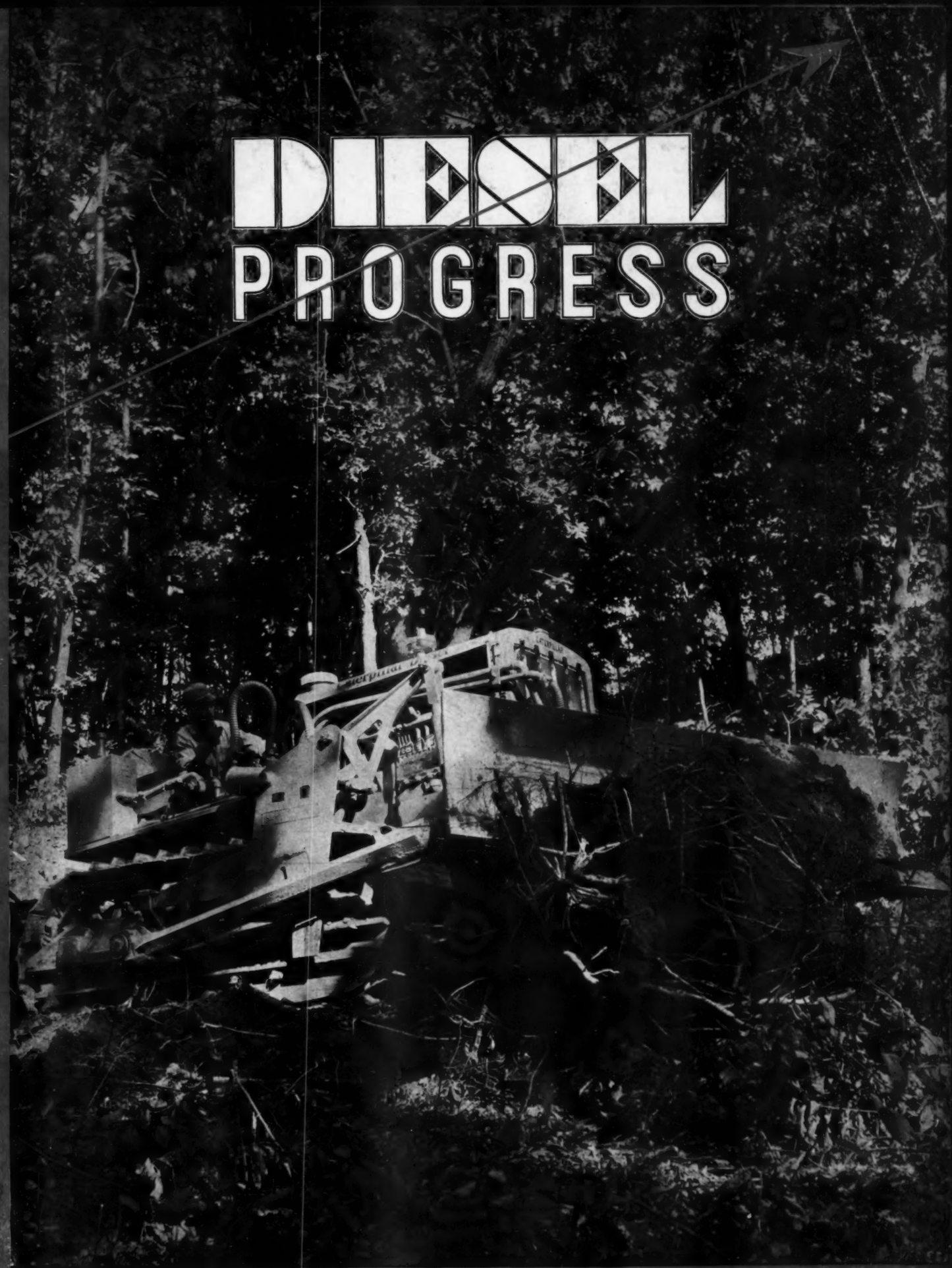
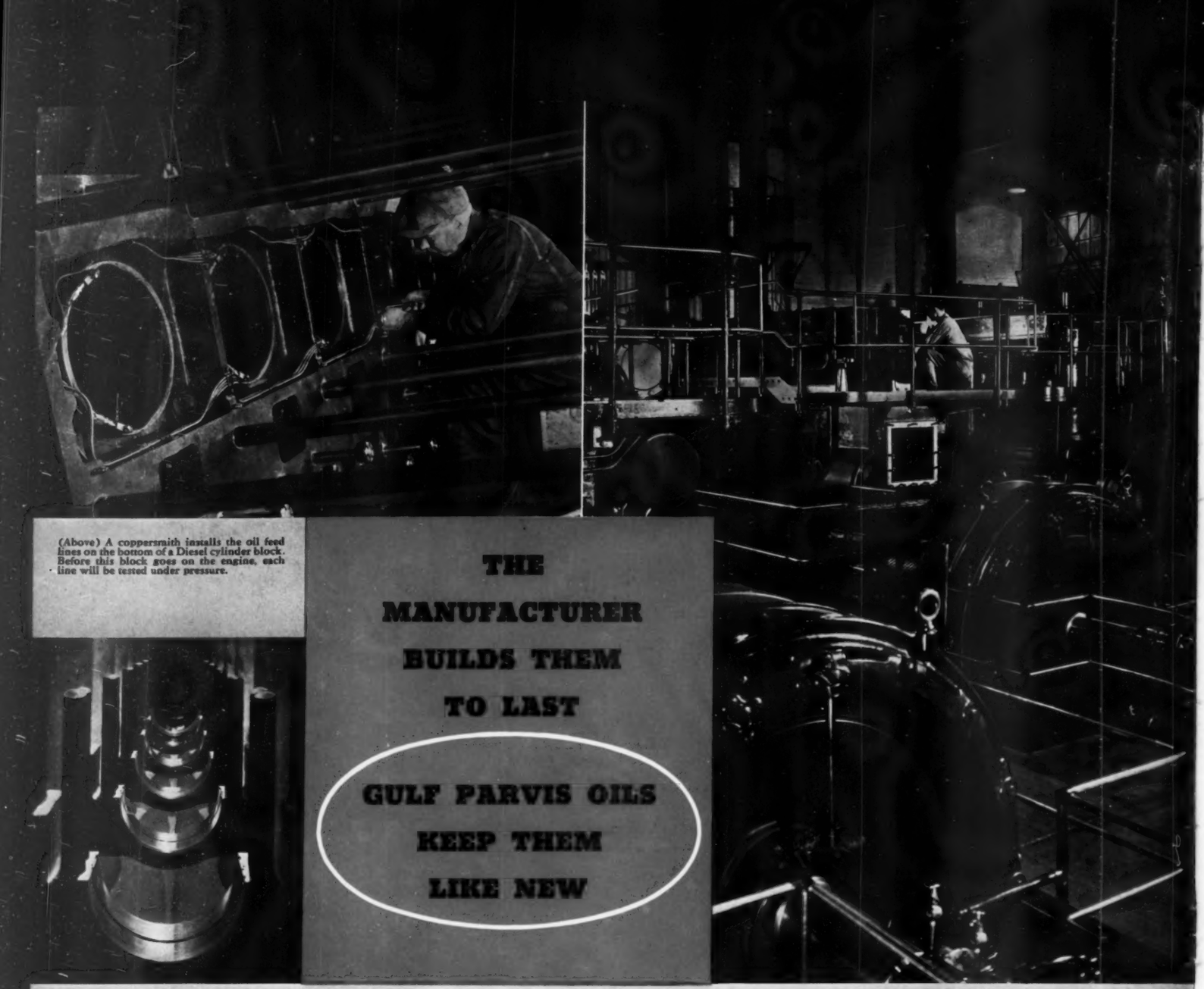
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



FEBRUARY, 1936 CIRCULATION OF THIS ISSUE—IN EXCESS OF 10,000 COPIES 25c



(Above) A coppersmith installs the oil feed lines on the bottom of a Diesel cylinder block. Before this block goes on the engine, each line will be tested under pressure.

(Above) The bearings have been set in place and are getting their final touch-up. Here are important points where the use of a quality lubricant will reduce friction to a minimum

THE MANUFACTURER BUILDS THEM TO LAST

GULF PARVIS OILS KEEP THEM LIKE NEW

The operator of the three Diesel engines shown above states that the use of Gulf quality lubricants has been an important factor in keeping these large units in continuous operation with minimum wear and repair expense.

You can keep wear and maintenance costs for your Diesel equipment at a minimum with Gulf Quality Lubricants

AMERICA'S Diesel engine builders—more than 50 strong—have approved Gulf Diesel lubricating oils for the engines they build!

This means that regardless of the type of Diesel equipment in your plant, its maker has tested and approved Gulf oils for its lubrication. That gives you real assurance that with Gulf lubricants in service, friction will be reduced to a minimum and you will get maximum protection against wear and operating troubles.

In Gulf's large staff of lubrication engineers are men thoroughly experienced with every problem of Diesel engine operation. If you are not using Gulf products, we suggest that you discuss the matter of lubrication with a Gulf representative. He can be of real assistance to you.

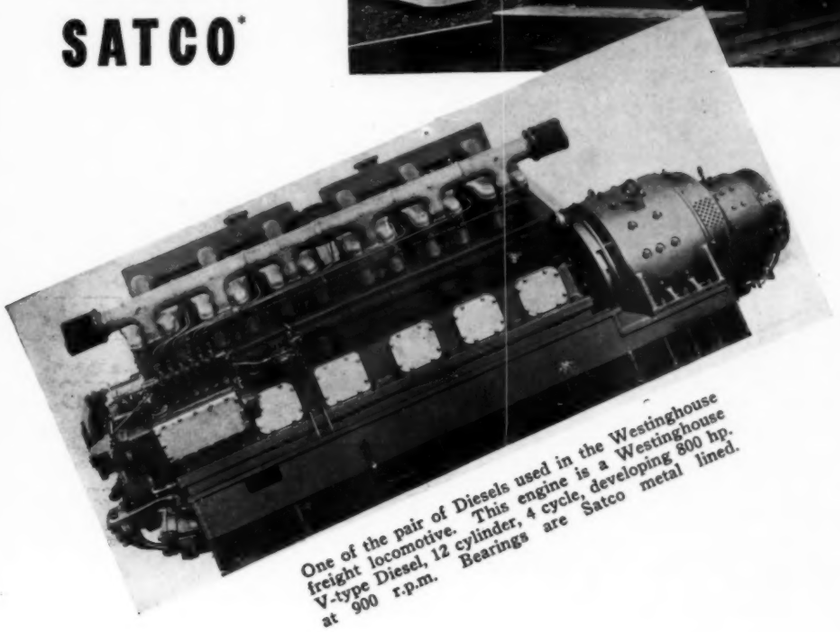
GULF REFINING COMPANY, PITTSBURGH, PA.

Division Sales Offices: Boston · New York · Philadelphia · Atlanta · New Orleans · Houston · Pittsburgh · Louisville · Toledo

Makers of that Good Gulf Gasoline and Gulflube Motor Oil

DIESEL PROGRESS for February, 1936. Volume II, No. 2. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at Brooklyn, New York, authorized May 14, 1935. Subscription rates: United States and Pan American countries $3.00, Canada and all other countries $5.00 per year. Single copy price 25 cents in U.S.A., 50 cents for all other countries.

ANOTHER PIONEER PICKS SATCO*



One of the pair of Diesels used in the Westinghouse freight locomotive. This engine is a Westinghouse V-type Diesel, 12 cylinder, 4 cycle, developing 800 hp. at 900 r.p.m. Bearings are Satco metal lined.

THE husky, efficient-looking locomotive pictured above, was built by Westinghouse Electric & Manufacturing Company at their South Philadelphia plant. This modern "iron horse" is the first Diesel main line freight locomotive. It is a pioneer that points the way to economical freight transportation by rail.

The bearings in the twin Diesel engines in this locomotive are Satco metal lined. Bearings of this type have rolled up truly amazing mileage records in the Diesel-powered locomotives which pioneered the new trend in passenger transportation by rail.

Your consideration of our Satco lined bearings is asked not because they are a recent development, not simply because they are different from other white metal alloy bearings . . . we bring them to your attention because we sincerely believe they will do a better job in all types of Diesels.

*A patented alloy manufactured by National Lead Co. Trade mark registered.

CENTRIFUGAL American Bearings FORCE

AMERICAN BEARING CORPORATION

INDIANAPOLIS, INDIANA

AFFILIATED WITH NATIONAL LEAD COMPANY

ECONOMIES PICKED AT RANDOM FROM OILS CHOSEN CAREFULLY

What Gargoyle D.T.E. Oils Do in Service Tells More about Superiority than mere Claims

MANY of Socony-Vacuum's present customers did not always use Gargoyle D.T.E. Oils in their Diesels. But, desiring greater engine efficiency—a larger measure of worthwhile operating economies, they tried, compared, standardized on Gargoyle D.T.E. Oils.

Results shown on the opposite page are not hand-picked—they're taken at random from thousands of service reports. If you are not using Gargoyle D.T.E. Oils, it will pay you to talk with the Socony-Vacuum representative when he calls at your plant. Ask him for facts proving their superior performance in operations similar to your own.

SOCONY-VACUUM
INCORP

STANDARD OIL OF NEW YORK DIVISION · WHITE STAR DIVI
WADHAMS OIL COMPANY · MAGNOLIA PETROLEUM COMPANY

REPAIRS REDUCED

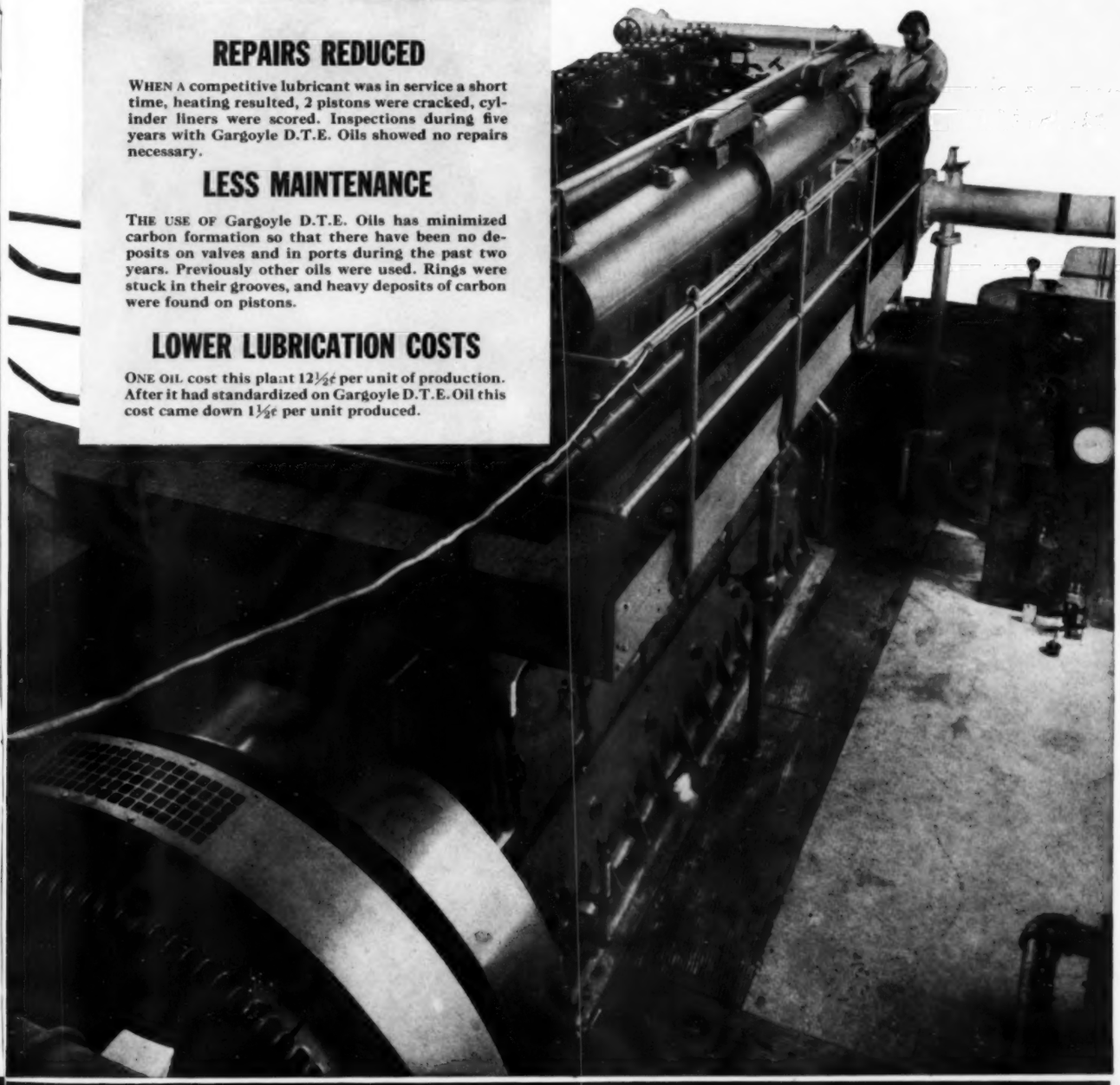
WHEN A competitive lubricant was in service a short time, heating resulted, 2 pistons were cracked, cylinder liners were scored. Inspections during five years with Gargoyle D.T.E. Oils showed no repairs necessary.

LESS MAINTENANCE

THE USE OF Gargoyle D.T.E. Oils has minimized carbon formation so that there have been no deposits on valves and in ports during the past two years. Previously other oils were used. Rings were stuck in their grooves, and heavy deposits of carbon were found on pistons.

LOWER LUBRICATION COSTS

ONE OIL cost this plant 12½¢ per unit of production. After it had standardized on Gargoyle D.T.E. Oil this cost came down 1½¢ per unit produced.



OIL COMPANY

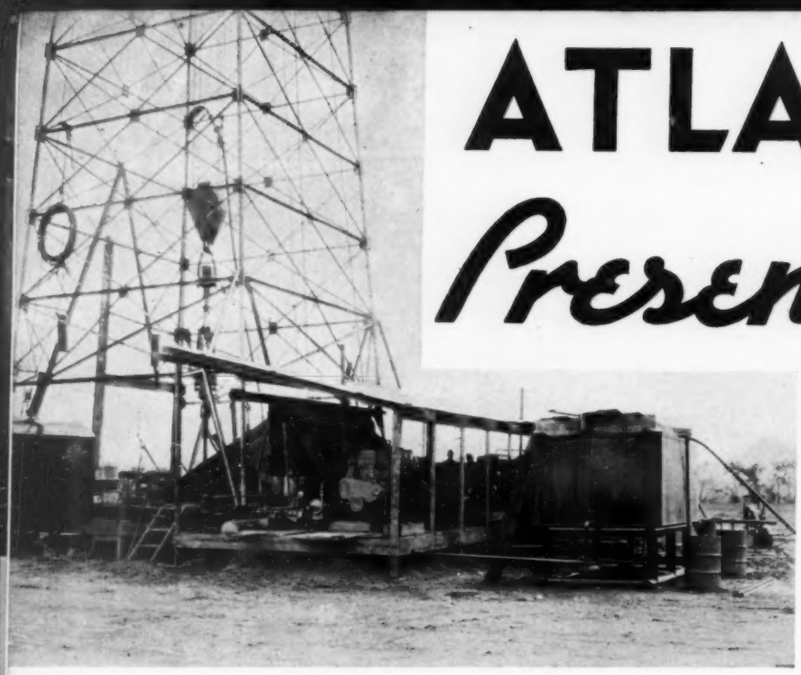
ORATED

SION · LUBRITE DIVISION · WHITE EAGLE DIVISION

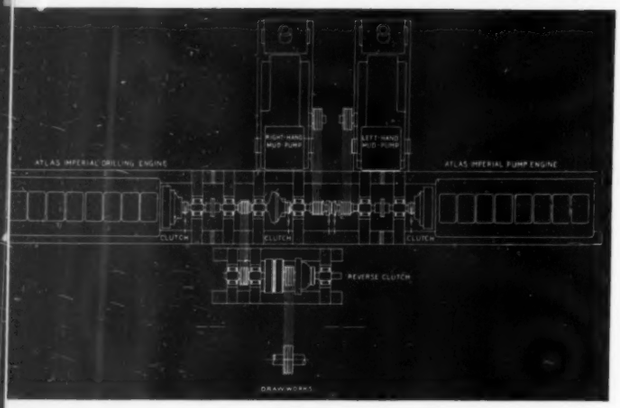
GENERAL PETROLEUM CORPORATION OF CALIFORNIA

GARGOYLE

Lubricants



ATLAS DIESEL *Presents* NEW *Mechanical Hook-up!*



As pioneer in the development of **DIESEL DRILLING**, this organization is proud to present to the oil fraternity a new mechanical hook-up which has such distinct advantages over the conventional methods now employed that it has won immediate and unqualified approval in the **Mid-Continent Field.**

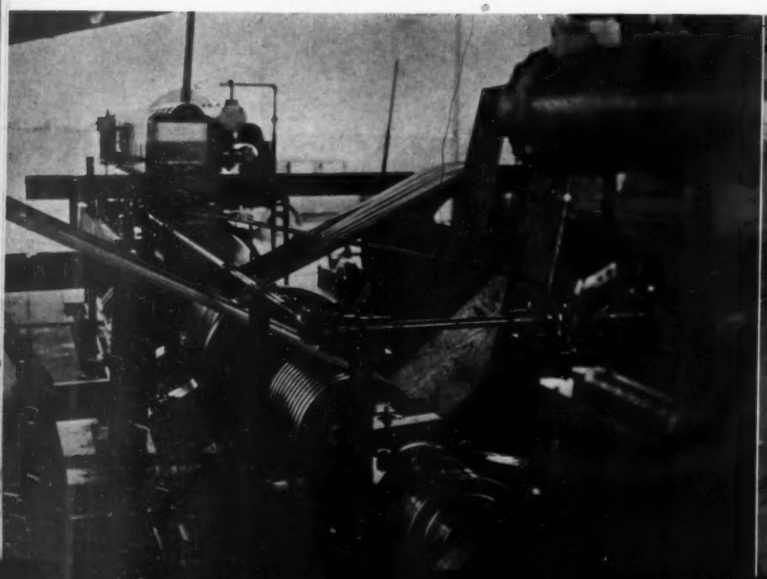
Conceived by **K. S. Richards**, our distributor at **Wichita**, and developed by **Atlas** engineers, this new hook-up offers the following advantages:

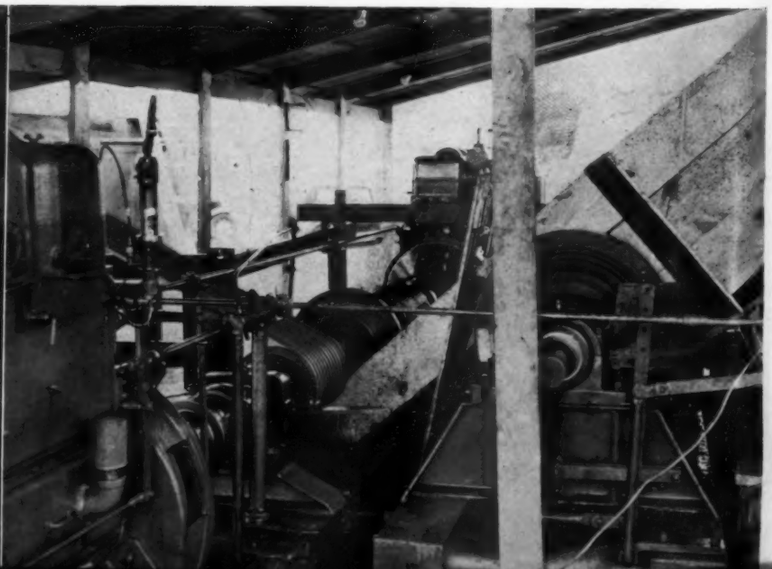
1. It gives the proper rotation to the mud pumps.
2. It is unnecessary to engage jaw clutches in compounding the power of two engines.
3. Employing a Twin Disc clutch, it is unnecessary to stop the engines to compound the power as it is with gear boxes or jaw clutches.
4. The hook-up includes but one jaw clutch—that to the power pump, which is disengaged when engines are compounded for coming out of the hole.
5. The compounding of power and manipulating of all controls, including clutches, is controlled manually from the drillers position.
6. Available in three sizes: 2-120 H.P., 2-200 H.P., and 2-275 H.P. Units mounted on 12" H-beams designed for ready portability and to maintain engine alignment.

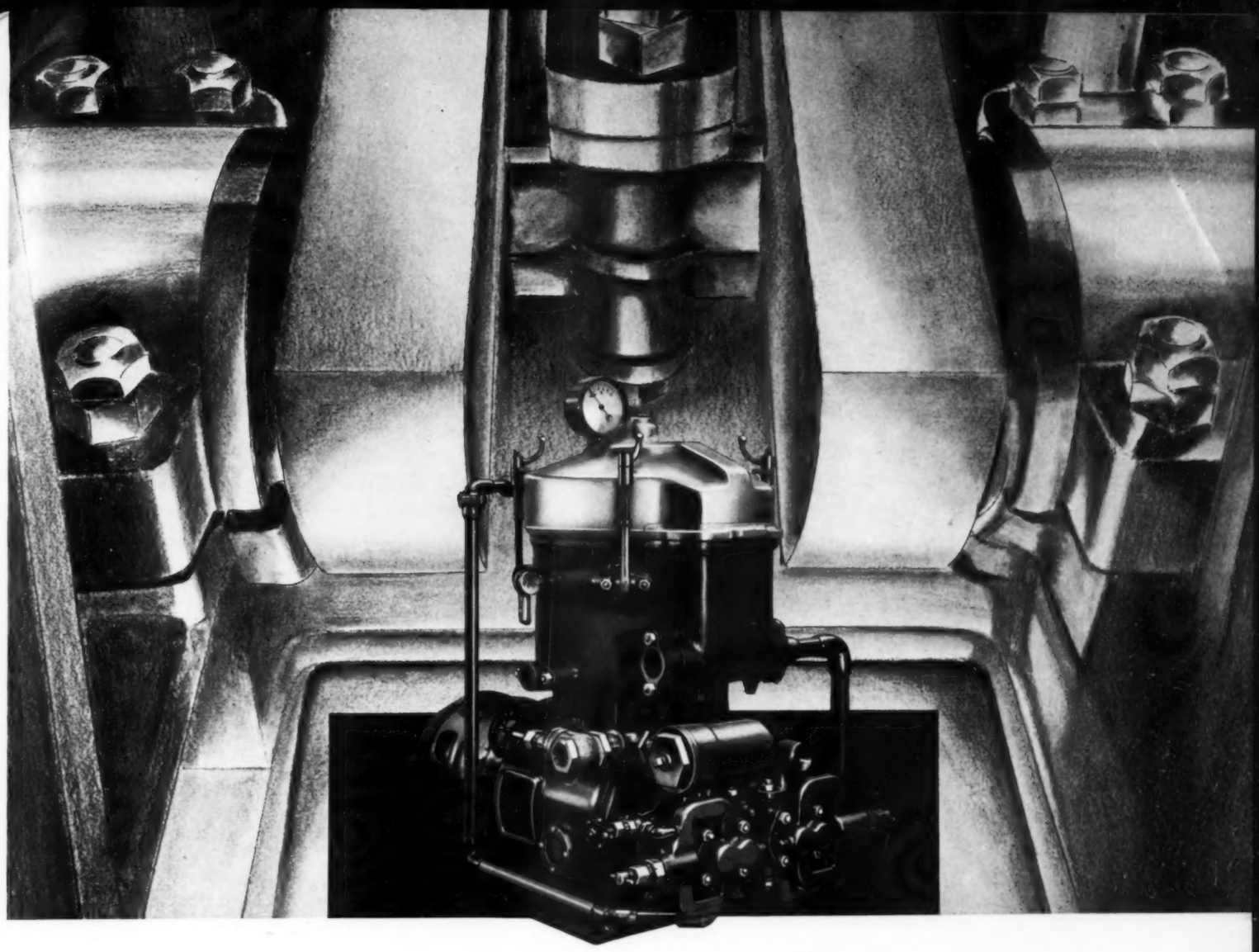
The engines employed in this hook-up are of the **Atlas Imperial** Industrial Type, fully enclosed and dustproof. They have been used successfully in oil well drilling and pumping in all parts of the world and are standard equipment with prominent manufacturers of excavating equipment. **Oil field service is maintained at Los Angeles, Houston and Wichita.**

ATLAS IMPERIAL DIESEL ENGINE CO.
OAKLAND, CALIFORNIA • MATTOON, ILLINOIS

ATLAS IMPERIAL







for non-stop performance

GOULDS HYDROIL

CENTRIFUGAL PURIFIER

IN the Goulds Hydroil Purifier, a centrifugal force many thousand times greater than gravity is produced. This force easily, quickly and effectively separates impurities from fuel and lubricating oils.

Hydroilized fuel oil is free from the dirt and water that impairs firing efficiency. The removal of abrasive matter reduces wear on fuel pump plungers, valve seats and cylinder walls—does away with clogged injector nozzles.

On lubricating oils the Goulds Hydroil removes dirt, moisture, grit and harmful carbon deposits, producing clean oil so essential for efficient, long non-stop performance. Frequent rest periods are unnecessary and oil can be used over and over without damage to bearings or plugging of oil lines.

690

GOULDS PUMPS Inc.

SENECA FALLS N. Y.

ATLANTA, BOSTON, CHICAGO, HOUSTON, NEW YORK, PHILADELPHIA, PITTSBURGH, TULSA, Representatives in all Principal Cities

DUST-
PUBLIC ENEMY No. 1

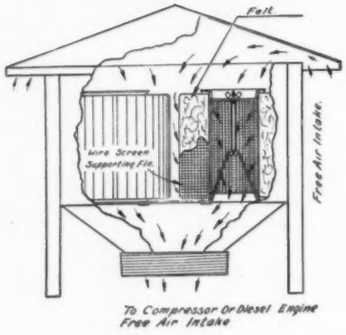


Diagram shows direction of air flow, entering under eaves of weatherproof shed and passing downward through filters.

One of two 2,500 C.F.M. Protectomotor Air Filters on roof of New York Central power house in new Buffalo Terminal. Two 1,500 C.F.M. units, similar in construction, but of hanging type, supply clean air to two large Diesel engines at New York Central's Selkirk yards. Seven compressors here also equipped with Protectomotor Filters.

DURING the recent dust storms West of the Mississippi, as much as 30 tons of dust per square mile were deposited in some sections. Some of the fine sand and silt was carried 200 miles.

The U. S. Weather Bureau estimated that 5,000 tons of dust were constantly floating over Washington during a dust storm in 1934 — enough to load a string of one-ton carts 25 miles long.

Dust can safely be considered Public Enemy No. 1 to Diesel engines, compressors and pneumatic tools.

A 1,000-bhp. Diesel engine will draw in 180,000 cu. ft. of air per hour. If the air contains 3 gr. per 1,000 cu. ft., 77 lbs. of dust and dirt will be drawn in every 1,000 hours.

These billions of sharp, abrasive dust particles cause excessive wear on all parts in sliding contact with each other.

By installing Protectomotor Air Filters on your Diesel engines, you can reduce such maintenance costs as liner wear, re-boring and replacement — valve leakage, grinding, refacing and replacement — bearing wear, keying-up and replacement, etc.

Protectomotor Air Filters frequently save

PROTECTOMOTOR
REG. U.S. PAT. OFF.
99 9/10 Per Cent EFFICIENT
AIR FILTERS

enough money in repairs to pay for themselves in one month.

Protectomotor Filters prevent 99 9/10% of the dust particles in the air from getting into machines and tools. Therefore wear is reduced 75 to 85% and engines kept running 3 to 5 times longer before overhauling is needed. About ¾ of the work and expense of cleaning carbon and grinding valves is eliminated. Oil consumption is cut 25%.

Protectomotor Air Filters pass air through a dry filter medium of negligible resistance. Their efficiency is not reduced by collected dust.

They operate from 6 months to a year without cleaning and can be cleaned quickly with compressed air without removing the filtering unit. They have no moving parts and require no cleaning tanks or adhesives.

To prove the big savings effected by Protectomotor Air Filters, we'll send one free for 30 days' trial. No proof, no charge. Thousands have been sold on that test alone.

Write for catalog or mail the coupon.

STAYNEW FILTER CORP.
5 LEIGHTON AVE., ROCHESTER, N. Y.

PROTECTOMOTOR
REG. U.S. PAT. OFF.
99 9/10 Per Cent EFFICIENT
AIR FILTERS

INTAKE FILTER

Clean, white filtering element before being placed in service on machine.

After few weeks' service showing dust, sand, grit and dirt kept out of machine.

MAIL COUPON TODAY!

STAYNEW FILTER CORP.
5 Leighton Avenue, Rochester, N. Y.

Without obligation on our part, you may

☐ Send a copy of your catalog.
☐ Send a Protectomotor for use on.....

If not satisfactory after 30 days' service, it may be returned for full credit.

Name .....

Address .....

City ..... State .....

EVERY USER OF POWER EQUIPMENT NEEDS THIS BOOK

Recognized leaders in manufacture of power equipment protect their own engines and compressors with American Air Filters and recommend their use to purchasers of their equipment. In fact, the manufacturers of over 90% of all stationary air compressors, Diesel engines, and gas engines in the United States recommend AMERICAN VISCOUS IMPINGEMENT FILTERS exclusively.

Here is a straightforward, comprehensive appraisal of the value and need of air filtration for all types of power equipment. All of the important facts regarding the types of air filters recommended for Diesels, gas engines and compressors are set forth in an interesting understandable way, as well as technical data covering the engineering principles and uses of each type of American Air Filters.

Use the coupon for your free copy. If, after reading it, you would like additional copies for the use of your plant superintendents, we would be glad to supply them.

AMERICAN AIR FILTER COMPANY, Inc.
280 Central Ave., Louisville, Ky.

Gentlemen:

Please send me a copy of Bulletin No. 120 A.

Name _____

Address _____

City _____ **State** _____

AMERICAN
AIR FILTERS

Ten Below Zero!

Test data and photograph courtesy Electric Storage Battery Co.

THE

COMET DIESEL

STARTS "COLD"

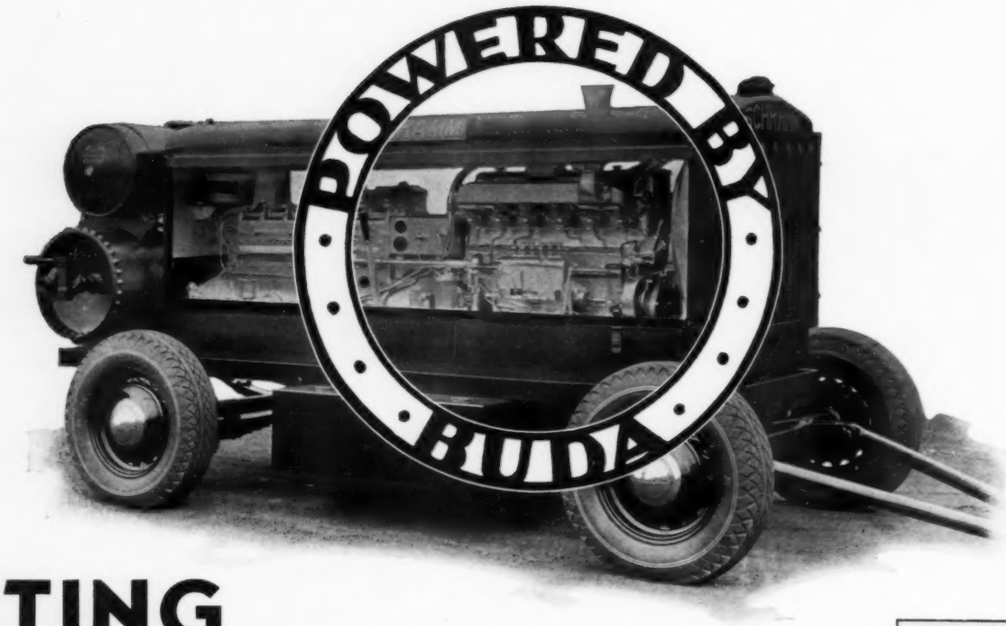
EVEN IN

COLD WEATHER

•

• Is the Comet Diesel easy to start when it is ten below? That was the question put to Waukesha engineers, and they passed it on to the testers in the ice box at the Electric Storage Battery Company laboratories. A complete series of cold weather starting tests was conducted . . . under every possible condition. All the results revealed by these tests are available in a new bulletin. Send for it. Learn what cold weather does to the viscosity of lubricating oil . . . how it affects the fuel system of a Diesel engine. That the Comet Diesel would start under extreme conditions was a safe surmise. Now the facts are known. When you write, ask for Bulletin 1013. *Waukesha Motor Company, Waukesha, Wisconsin.*

WAUKESHA ENGINES



PUTTING "ROADABILITY" into a 210 cu. ft. DIESEL COMPRESSOR!

SCHRAMM Inc., through the use of Buda Diesel engines has introduced real "Roadability" to their new model 210 ft. Compressor.

By using the Buda 6LD-468 six cylinder Diesel Engine and the "Utility" type Schramm Compressor the weight has been cut 5000 lbs. over the ordinary Diesel powered compressor, making a compact, clean cut unit and materially reducing the cost of hauling and the difficulties of handling.

Perhaps you have a similar problem—one where weight and size impose difficulties. The compact design and unusual construction of Buda Engines make possible maximum power with minimum weight and space required.

Or perhaps you have another power problem! Buda Engineers can help you as they have helped countless other manufacturers. Why not ask them. There is no obligation.

Stationary Compressor

Mine Locomotive

BUDA DIESELS Are Standard on These Products

Locomotives · Refrigerators · Cranes · Logging Equipment · Hoists · Rollers
Generating Sets · Injection Pumps · Compressors · Boats · Sweepers · Pavers
Feed Grinders · Crushers · Dredges · Trucks · Busses · Shovels
Well Drilling Equipment · Oil Field Pipe Line Equipment

H.P. from 32 to 180

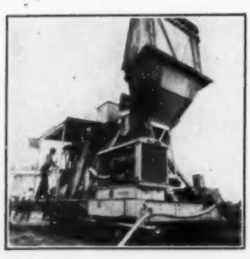
THE BUDA COMPANY • Harvey [CHICAGO SUBURB] Illinois

Industrial Division K

Hoist

BUDA ENGINES

Paver



Road Roller

Pipe Line Pumping

Shovel

Lighting Plant

TUCSON, ARIZONA

Erie crankshafts were selected for the two 3750 h.p. air injection Busch-Sulzer Bros. Diesel engines installed in 1928. Again in 1932 when additional power and light units were required a 4000 h.p. solid injection engine was furnished by the same builder and equipped with an Erie crankshaft.

CRANKSHAFTS

Leading engine builders rely upon our experience and complete facilities for the manufacture of crankshafts and other forged parts, finished to the most exacting tolerances necessary for the smooth performance of their engines.

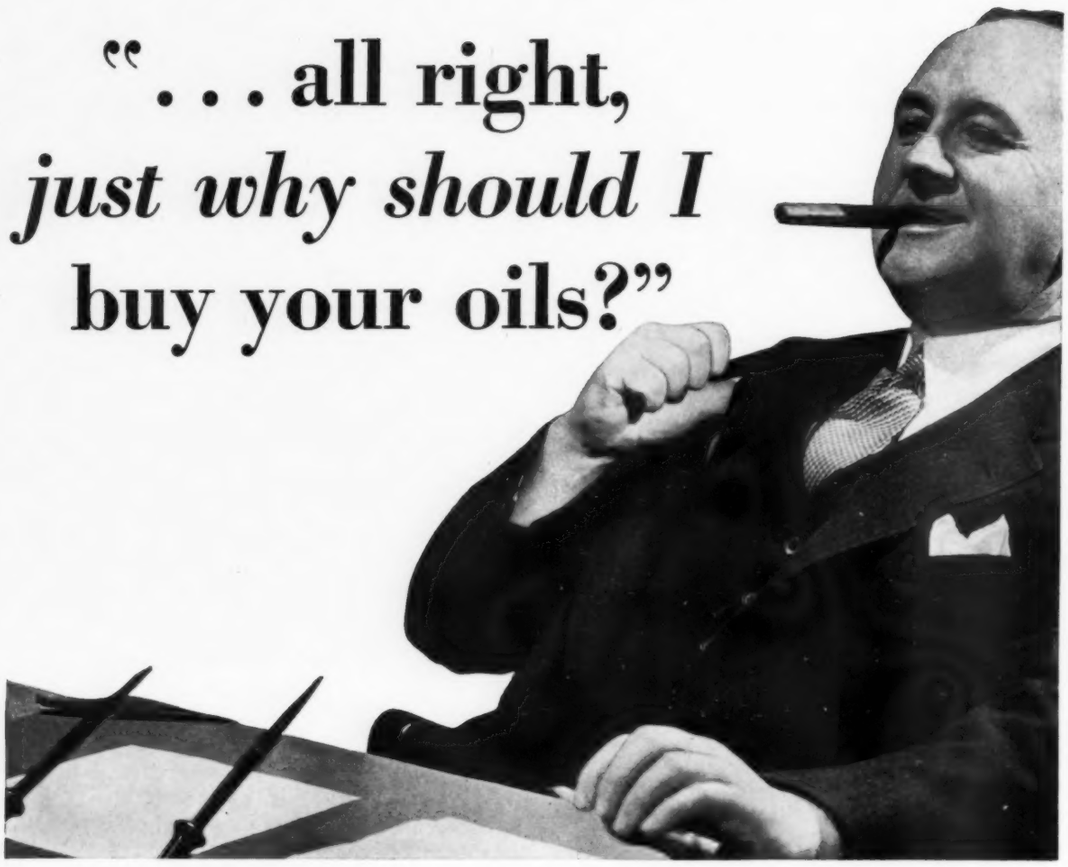
ERIE FORGE COMPANY

ERIE
PENNSYLVANIA

WE ALSO MAKE:

Rough and finished connecting rods, piston rods, crossheads, generator and extension shafts for all classes of stationary and marine engines. Complete facilities for prompt delivery on all major forged or cast steel elements required in the building and powering of every type of installation.

"... all right, *just why should I* buy your oils?"



It was a hard-boiled, open-minded challenge, and we took it

HERE IS WHAT WE TOLD HIM—

"There *are* definite advantages to users of these lubricants.

"Take your Diesels, for example. You will get freer piston rings and improved piston seal at all times with Texaco Ursa Oils. This is because these lubricants are refined from crudes especially selected for this purpose.

"Advanced refining methods have made Ursa Oils extremely pure.

"Many oils that are not entirely free from gum and carbon forming elements form hard carbon deposits and are not suitable for Diesel lubrication.

"With Ursa, what little carbon does form is of a dry, fluffy nature that is blown out through the exhaust.

"This extreme purity and oiliness maintain complete compression—consequently you get greater fuel economy and freedom from unnecessary cylinder wear.

"Users say that Texaco Ursa Oils reclaim readily. Many others tell of reduction in maintenance costs of 50% or more."

In other fields, too...

In the aviation industry, three-fourths of the major airlines use Texaco Products. In the bus transportation field, more bus-miles are operated with Texaco than with any other brand.

In your plant, Texaco Ursa Oils will deliver the same outstanding performance as in these specific instances we have enumerated here.

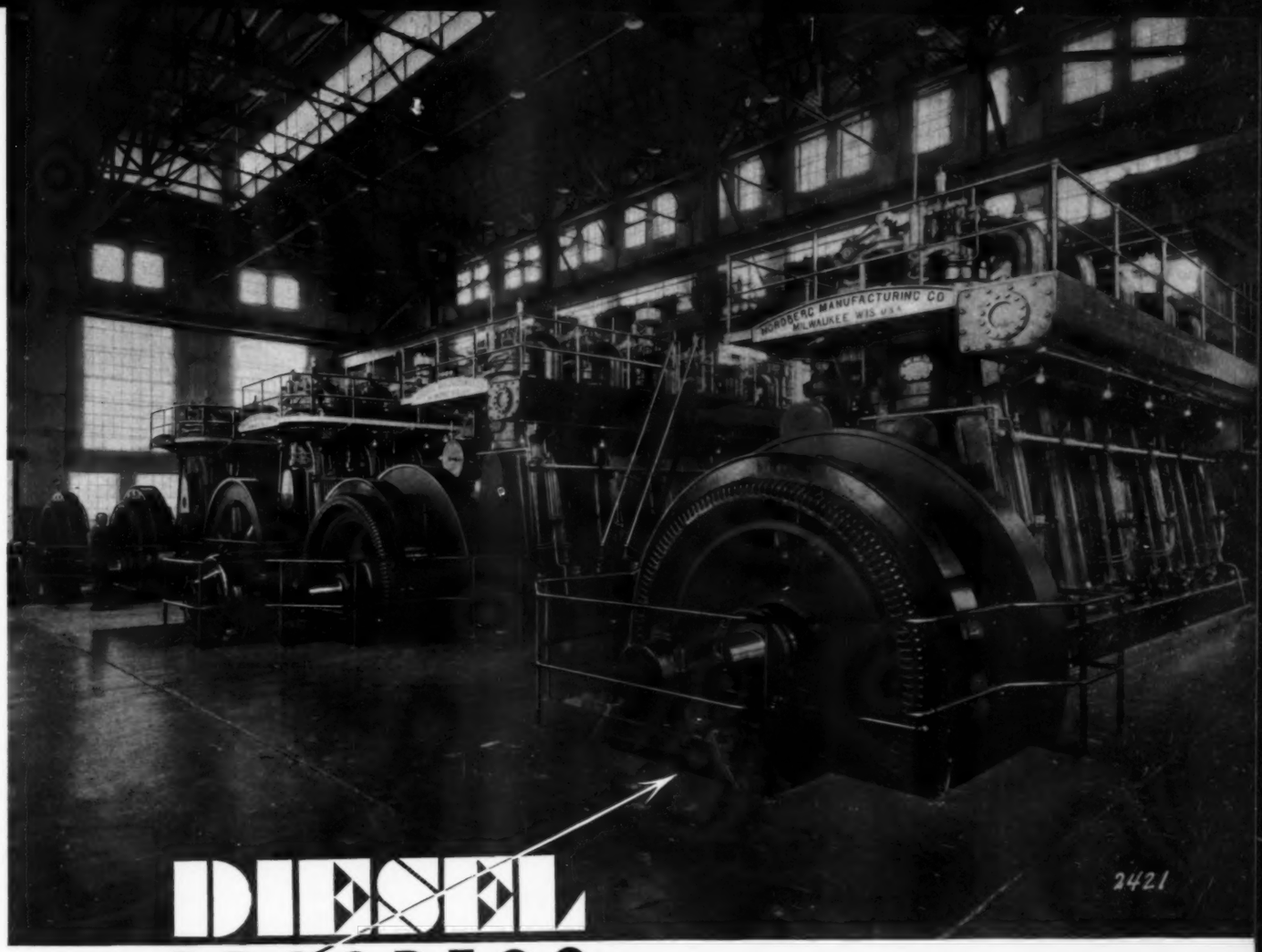
Write to The Texas Company and we will send our representative to serve you.

THE TEXAS COMPANY
135 East 42nd Street • New York City
Nation-wide distribution facilities assure prompt delivery

IN SERVICE TO INDUSTRY

All important Diesel manufacturers approve Texaco Ursa Oils for the lubrication of the equipment they make.

TEXACO *Industrial Lubricants*



DIESEL PROGRESS

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FRONT COVER ILLUSTRATION — Clearing the way for a new Illinois road — a Caterpillar Diesel tractor equipped with a trailbuilder is shown swiftly cutting a road through the timber near Peoria, Ill.

TABLE OF CONTENTS ILLUSTRATION — Ponca City, Okla., enjoys the distinction of owning and operating one of the most successful Diesel municipal power plants in the country. This plant consists of a pair of 1,250 hp. Nordberg Diesels installed in 1923 and two engines of similar size and make installed in 1928.

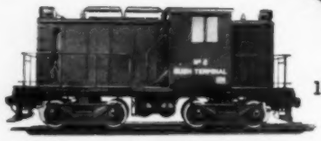
Diesel Electric Locomotives in the United States

1923
Original Demonstrator

1925
C.R.R. of N. J. 300 HP.

1927
Long Island 600 HP.

1929
Erie R.R. 800 HP.



1931
Bush Terminal 300 HP. steeple

1933
Lackawanna 600 HP. steeple

118 DIESEL LOCOMOTIVES IN SERVICE

The first successful Diesel engine for locomotive service in the U. S. A. was developed by the Ingersoll-Rand Company in 1923, and the first locomotive sold was to the Central R. R. of N. J. in 1925.

To date a total of 118 locomotives powered by Ingersoll-Rand Diesel engines have been sold. Each and every one of these locomotives is operating today.

It is the outstanding success of these locomotives in economy and reliability over a period of ten years of actual service that has made the Diesel-Electric locomotive a generally accepted type of railroad motive power.

As Originated and Developed by

1935

Ill. Central 1800 HP.

BIRMINGHAM
BOSTON
BUFFALO
BUTTE
CHICAGO
CLEVELAND
DALLAS
DENVER
DETROIT
DULUTH
EL PASO
KNOXVILLE

Ingersoll-Rand
11 BROADWAY, NEW YORK

LOS ANGELES
NEWARK
NEW ORLEANS
NEW YORK
PHILADELPHIA
PITTSBURGH
SALT LAKE CITY
SAN FRANCISCO
SCRANTON
SEATTLE
ST. LOUIS
WASHINGTON

DIESEL PROGRESS

REX W. WADMAN, Editor and Publisher

STATISTICS

THIS chart indicates the growth of the Diesel industry in horsepower sold from the year 1924 and through the year 1935. It is very evident that things happened during 1935 in so far as Diesel sales are concerned.

Breaking this total of a million and quarter horsepower down into industries, we find that three quarters of a million horsepower went into tractors, trucks, buses, road building equipment, etc. We find that about 250,000 hp. went into stationary or heavy industrial service, a straight, vertical increase of better than 60 per cent over 1934.

Railroads only took about 20,000 hp. in actual deliveries in 1935 but had another 35,000 hp. on order. Railroads are increasingly becoming a factor in Diesel production and this figure will show up prominently at the end of this year.

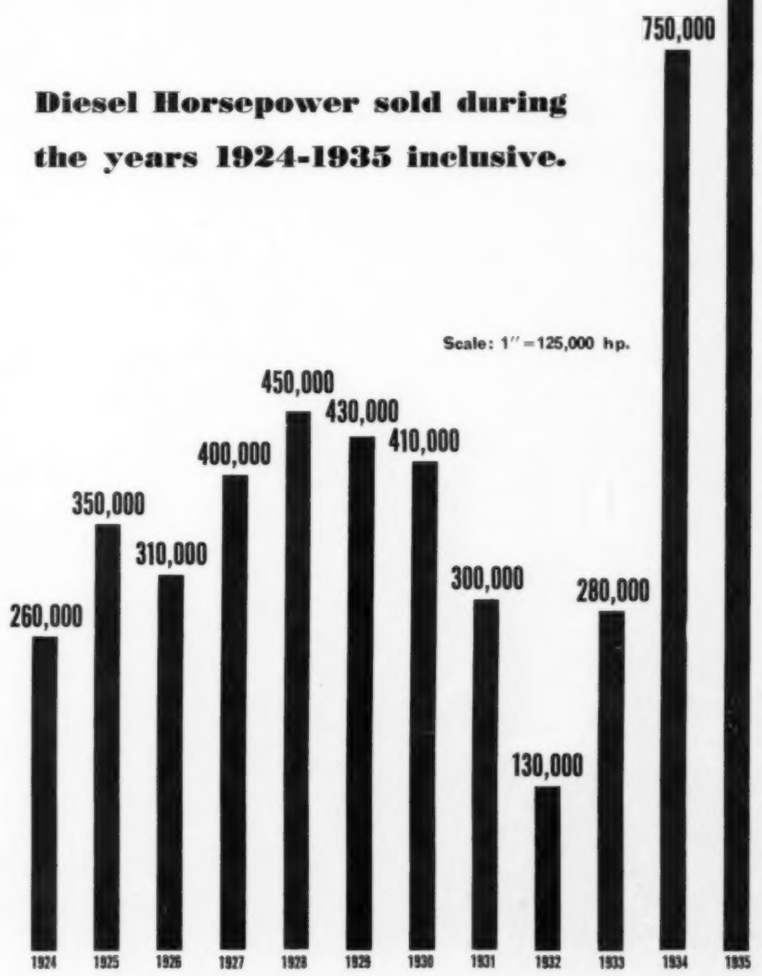
The marine consumption of Diesel horsepower in 1935 dropped a little over 30 per cent below the 1934 figure and was the only segment of the industry to fail to show a substantial increase over the previous year. The marine situation is changing rapidly though and marine sales have started to take their rightful place in the procession since the first of the year.

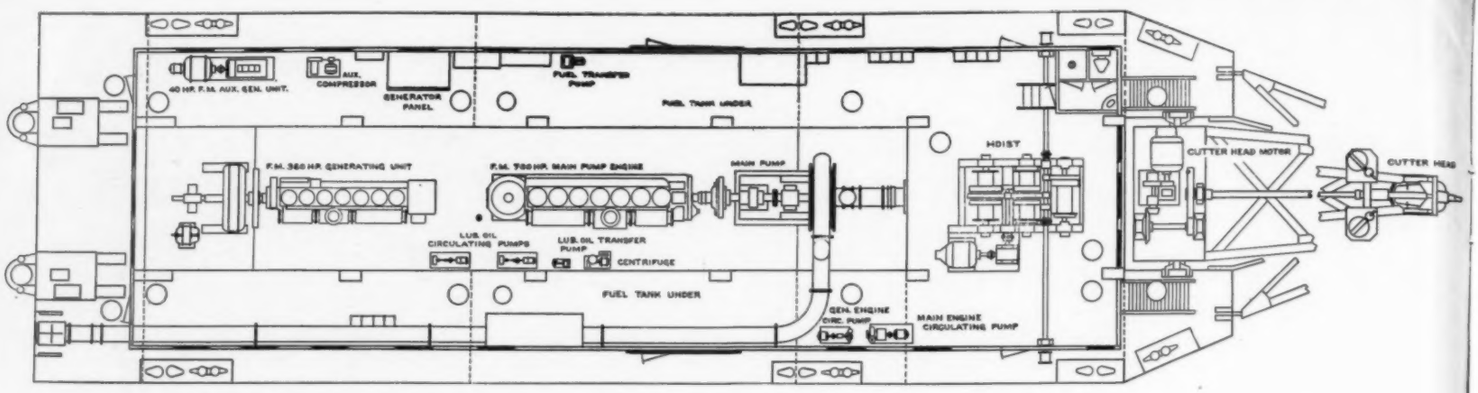
All in all the year 1935 was good to the Diesel industry but 1936 will be even better. I see nothing to stop production going through the two million hp. mark in the first nine months of this year, certainly by the end of the year. With the markets now available and immediately in sight it is not too optimistic to predict an annual Diesel production of five million hp. a year within the next thirty-six months.

After spending three days at the Road Show in Cleveland, four days at the Motor Boat Show in New York and after visiting all the engine shops east of the Mississippi, I feel safe in saying that the Diesel industry is "going to town" in no uncertain manner.

Rex W. Wadman

Diesel Horsepower sold during the years 1924-1935 inclusive.





THE DREDGE "BERNIE HARRIS"

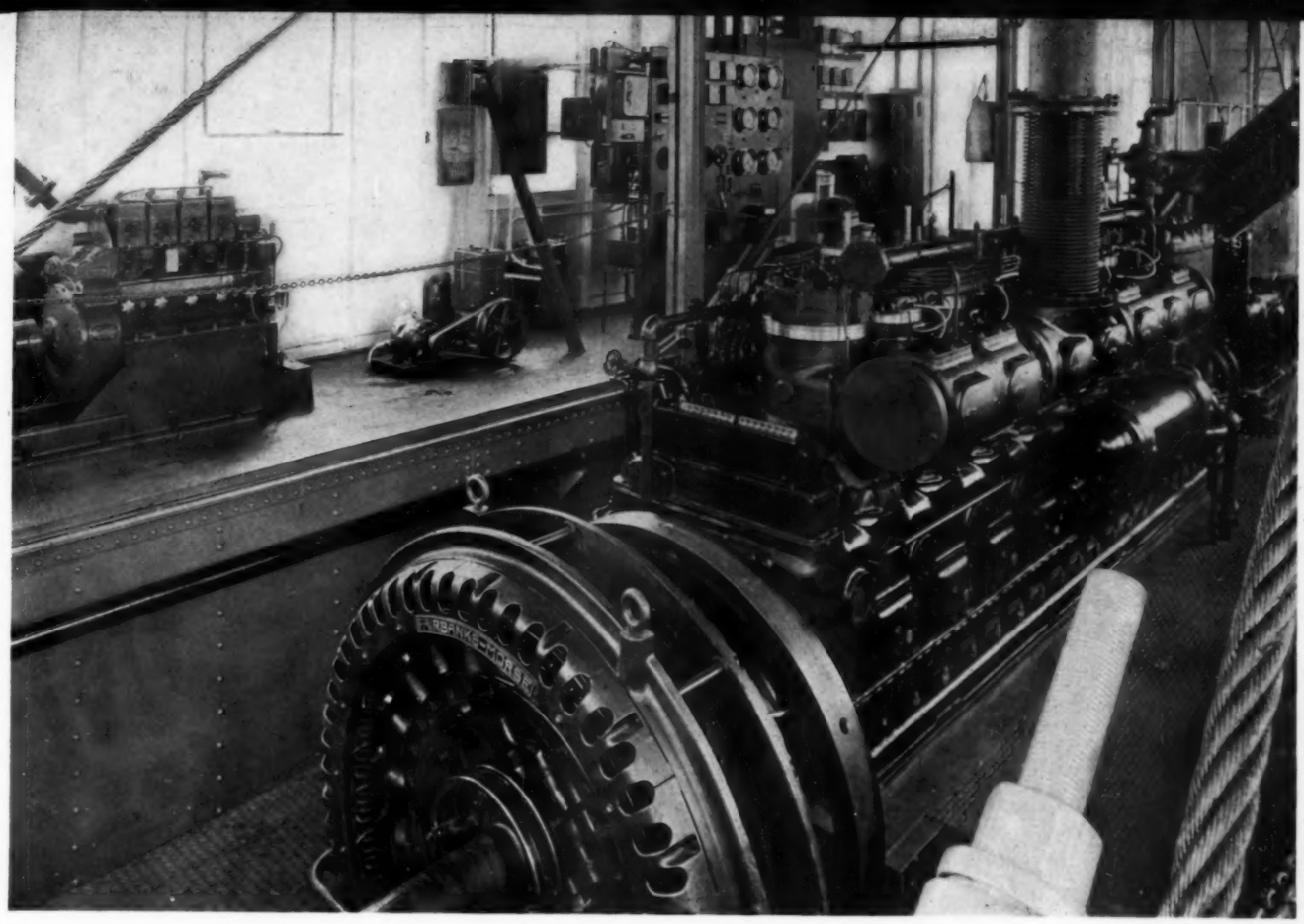
Letting Daylight Into the Engine Room

DIESELS and dredges have long been associated with each other in the minds of everyone even remotely interested in either one of these mechanical developments. The *Bernie Harris*, however, has attained the rare distinction of being a "daylight" dredge. Its basic floor plan and disposition of machinery is such that the operators move about their various duties with plenty of elbow room in a well lighted and cheerful interior.

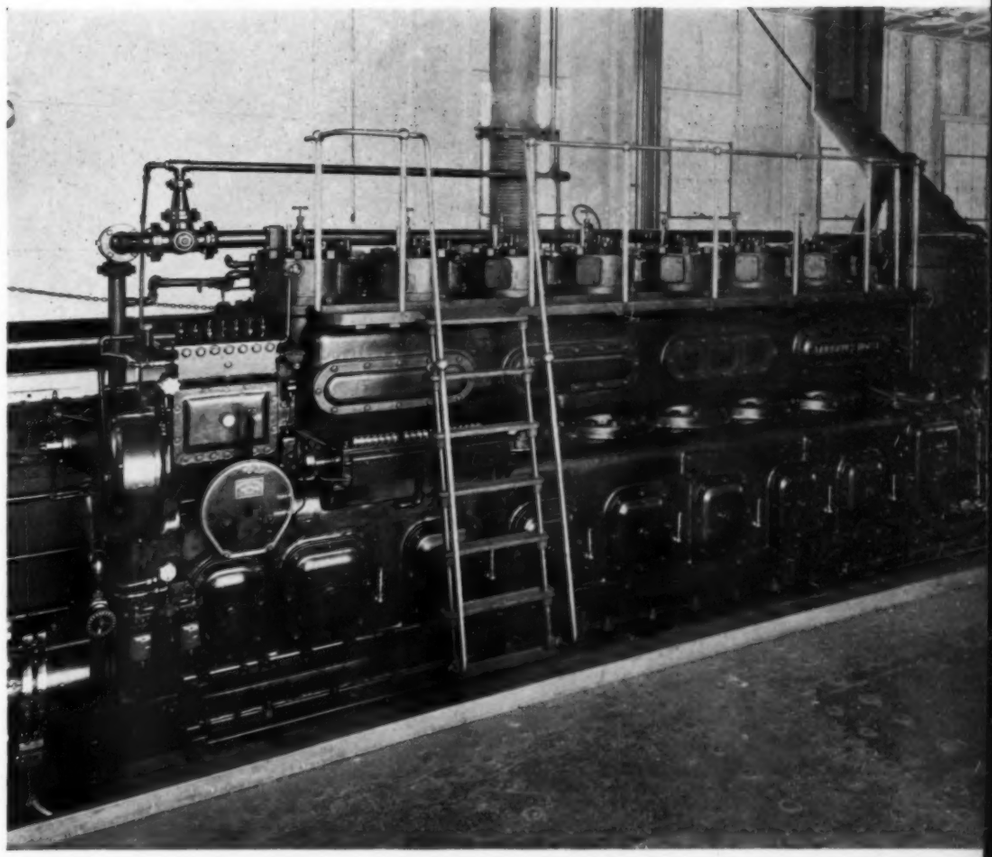
The *Bernie Harris*, now in service at the site of the Dresbach Dam near La Crosse, Wisconsin, was built at a cost of $250,000 at Midland, Pennsylvania. From there she was towed down the Ohio River to Cairo and thence up the Mississippi to her present field of operation. The unit is fitted with a total of 1,100 hp. of prime mover capacity, part of which is available for hydraulic pumping and the balance for generation of electric power to operate the cutter head and auxiliary equipment. The hull of the dredge measures 110 feet in length with a beam of 34 feet and a depth of 8 feet. Fully loaded with all equipment, fuel and ballast, the draft is approximately 5 feet.

The main power equipment was all furnished by Fairbanks, Morse & Co. and includes one 700 hp., 7-cylinder Diesel connected to a 16 in. Morris dredge pump through a Cutler-Hammer magnetic clutch and a 360 hp. 7-cylinder Diesel direct connected to a 305 kva, 480 volt alternator with a 10 kw. chain driven exciter. In addition there is provided a 40 hp., 4-cylinder, four-cycle Diesel direct connected to a 31 kva alternator with direct connected exciter for auxiliary service.

Additional equipment includes a 2" circulating



The accompanying illustrations show clearly the dredge on location, its space saving floor plan and most of the Diesel money saving equipment with the pumping engine below and, above, the generator set.



pump driven by a 7½ hp. motor for supplying cooling water to the 700 hp. engine; a 1½" pump driven by a 3 hp. motor for supplying circulating water to the 360 hp. unit and two 2 hp. motor driven rotary pumps are provided for oil circulation to the two main engines before and after operation. A motor driven two-stage air compressor, a 150 gph. lubricating transfer pump, a Hydroil lubricating oil centrifuge and a motor driven fuel transfer pump complete the main engine auxiliary equipment.

The cutter head drive is ball bearing, slip ring type, 3-phase, 60-cycle, 440 volt motor operating at 600 rpm. and rated at 125 hp. The hoist motor for raising and lowering the cutter head ladder is a sleeve bearing slip ring unit operated at 720 rpm. and rated at 50 hp. In addition, two 25 hp. motor driven centrifugal pumps, operated at 1,800 rpm. by squirrel cage motors are provided for general service.

While no statistics are as yet available concerning the operating cost of this plant, it may be said that the dredge in service has been entirely successful in meeting the exacting requirements of the owners.

A DIESEL DRILLING SAGA

ROTARY drilling of oil wells using Diesel engines as a source of power supply was first pioneered in the year 1926. The first of such operations was at Brea, California, where an Atlas Diesel drilled a 10-inch well to a depth of approximately 5,000 feet. The 4-cylinder drilling engine was rated at 150 hp. at 350 rpm. and drove a three-speed draw works with a 27-in. rotary table. In addition, a second Diesel of three cylinders, rated at 100 hp, at the same speed, drove a 6¾ x 14 in. mud pump. The well was "spudded in" on March 24 and the tubing was landed for production on April 25 or a net drilling time of 32 days.

Fuel oil consumption for the drilling Diesel for that period was 27.5 barrels and for the mud pumping Diesel 23.3 barrels, a total of 50.8 barrels at $1.65 per barrel, or a total fuel cost of $83.82. Forty gallons of lubricating oil were consumed by the two engines, which, at 65 cents per gallon, brought the total drilling power cost to $109.82.

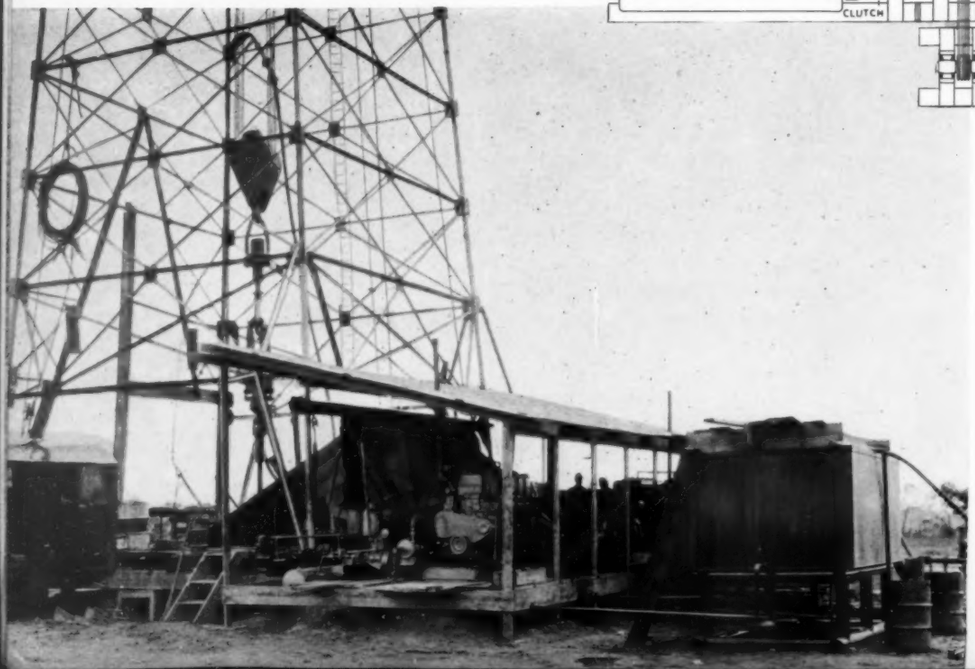
As a result of the thoroughly satisfactory results and the very economical cost of less than $3.44 per day, one of the major oil companies became intensely interested in this type of drilling. Consequently, the Atlas Engine Company, after considerable research and experimentation, developed and marketed a portable. medium speed Diesel drilling outfit with direct current, variable voltage controls.

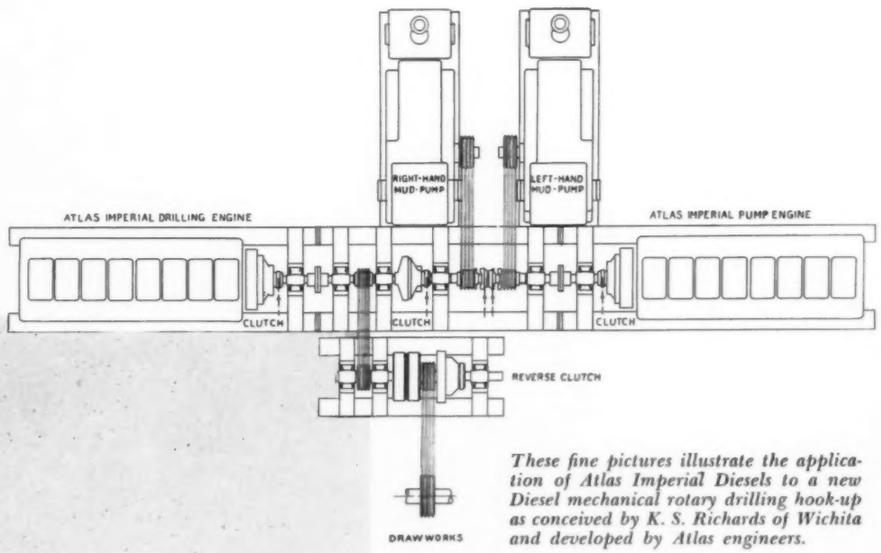
The first of these units ever built was placed in service in California about the year 1928. That rig is in operation today in New Mexico and is said to have completed more wells than any other internal combustion engine driven drilling equipment. Naturally, due to the success of the first Diesel driller, there are many similar units all over the world at this time.

As a result of the initial cost of direct current drilling equipment, a double engine, mechanical hook-up was later developed by the Sheldon Burden Corporation of New York City, who also selected Atlas Diesels for this service. This was the first attempt ever made to place Diesels end to end for oil well drilling so that the power from both could be compounded for either driving the mud pumps or coming out of the hole. This hook-up was also arranged so that in case either engine was shut down, it was possible to drive the pump and draw works with the other by engaging a clutch in a gear box. This system proved eminently satisfactory and many installations are now in use throughout the Midwest.

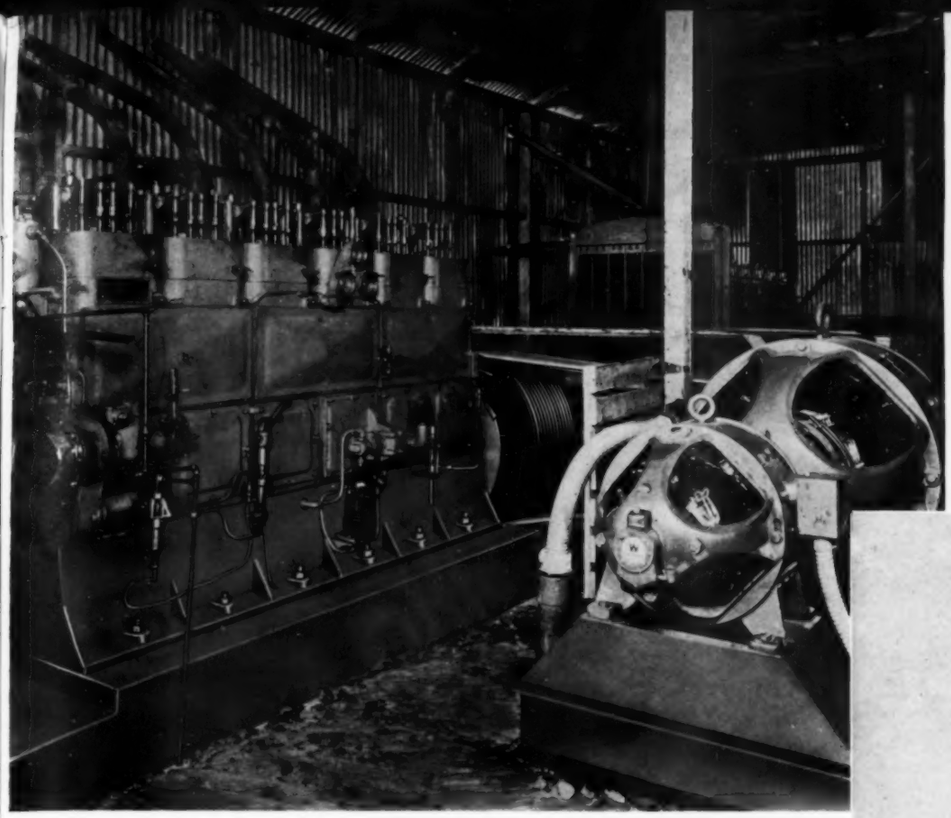
K. S. Richards of Wichita, Kansas, started pioneering Diesel engines in the oil industry and, as a result of his years of experience, has recently developed an arrangement that bids fair to be the most satisfactory mechanical hook-up in use in the oil fields today. This unit is built in three different sizes, using two 120 hp., two 200 hp. or two 275 hp. Atlas Diesels.

The engines are set end to end, one running clockwise and one counter clockwise. Each flywheel is equipped with friction clutches so as to disengage either engine. The mud pump engine and drilling engine are arranged so that the power of the two engines can be com-





These fine pictures illustrate the application of Atlas Imperial Diesels to a new Diesel mechanical rotary drilling hook-up as conceived by K. S. Richards of Wichita and developed by Atlas engineers.



Left—Here are the first two 200 hp. Atlas Imperial Diesels, V-belt connected to 125 kw. Westinghouse generators, which were used by Standard of California in sinking its "Vickers No. 24" in the Inglewood field in Southern California.

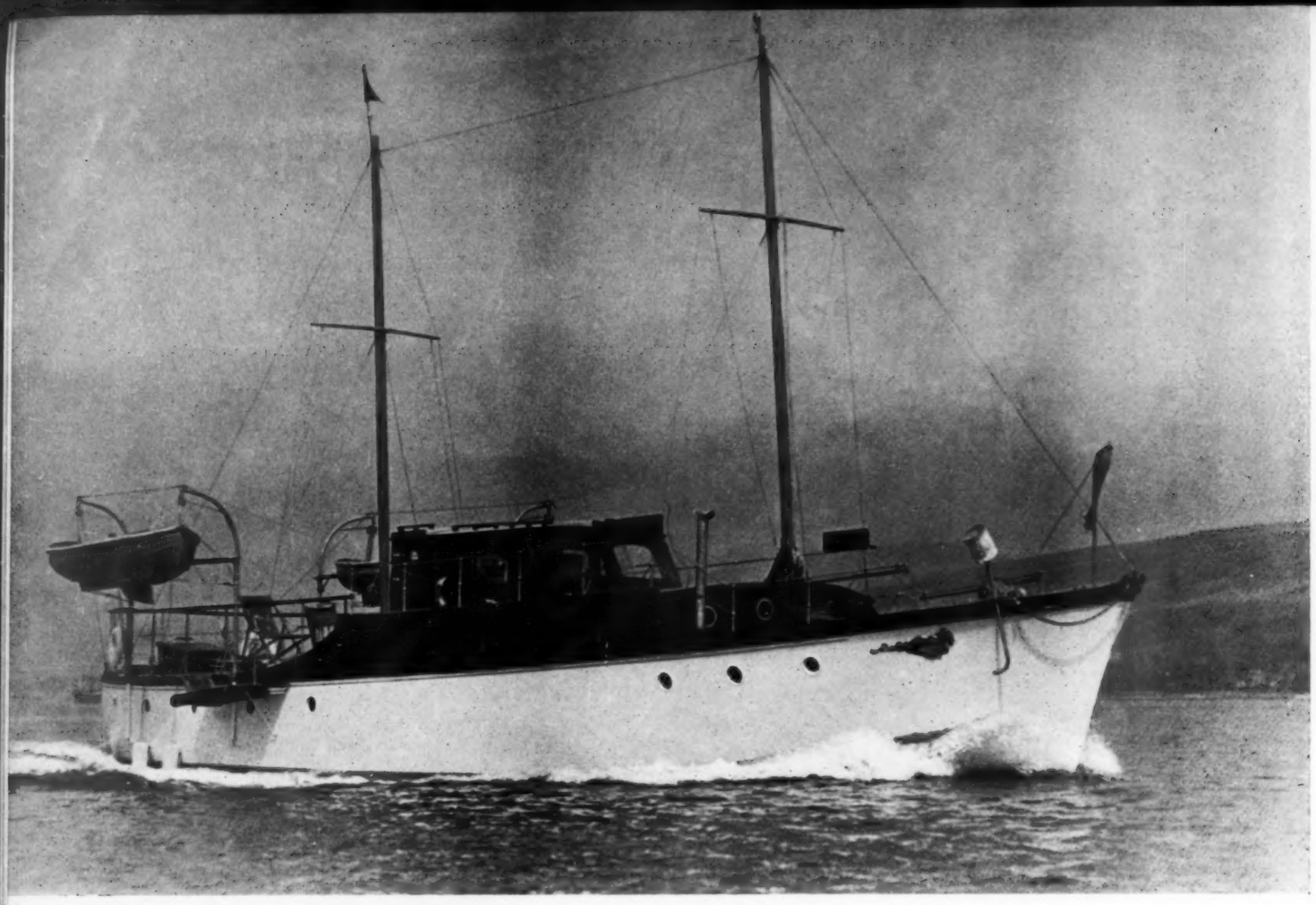
Below—This is the Standard Oil Company of California's "Vickers No. 24," the first Diesel-electric direct current drilled well in petroleum history. It was drilled to a depth of 2,500 feet in 32 days. The two Atlas Imperial Diesels consumed 136 barrels of 24 plus Diesel fuel oil and 74 gallons of Calco heavy lubricating oil. One barrel of make-up water was used daily.

pounded by engaging a clutch on the drive shaft for either hoisting or putting the power of the two engines to the mud pump.

Through this arrangement, should the mud pump engine be disabled, it is possible to disengage the friction clutch on this engine and engage the clutch used for compounding the power of the two engines and by this means drive the pump with the drilling engine and, at the same time, drive the draw works. The same applies to the drilling engine. Should the drilling engine become disabled it is a simple matter to disengage the friction clutch on this engine and engage the compounding clutch so that the mud pump engine would drive the draw works.

Should it be desired to compound the power of the two engines for coming out of the hole, it is necessary only to disengage the jaw clutch drive which operates the pump, engage the compounding clutch, and the power of the two engines would then be applied to the draw works.

The complete controls for the clutches and the throttles of the engines are located at the driller's post and he has complete control of the complete unit at all times. Due to the flexibility of this unit and the controls that have been worked out, a speed of from 20 rpm. to 170 rpm. can be obtained at the rotary table. Either chain or V-belt drives may be employed.



Twin Screw Diesel Yacht "Jester."

LONDON LETTER NUMBER 3

By GEORGE LIND

TOWARDS the end of November, 1935, was launched from a small Scottish ship-building yard the 50-foot line fishing boat *Glen Afric*. The *Glen Afric* is a typical example of modern Scottish fishing boat design and like 70 per cent of her classmates is powered with a Diesel engine.

The interest attached to this particular vessel is doublefold, first because she is now on her way to Port Elizabeth, East Africa to take up duties there as fleet leader to a local fishing boat owner, and second because of the splendid performance of her engines during a difficult voyage from the builders yard to the East India Docks. The owner, be it noted, arranged to send his boat the 600 odd miles from Scotland to London under her own power, a proceeding which at this time of the year is considered risky by even the most experienced trawler captains.

As was to be expected the *Glen Afric* ran into wild weather almost before her bows had touched the open sea. Within a few hours she was in the center of a terrific storm, the violence of the waves tearing away the copper sheeting from the bottom of her hull as if it were tin foil. Despite the raging seas, however, she managed to continue on her course and arrived safely at Blyth in Northumberland 3 days later somewhat battered but not very much the worse for the experience. During the whole of the journey she met only three other trawlers, the gale having driven the other small craft back to harbor.

The last section of the voyage was made nonstop, the 320 miles from Blyth to the London docks being covered at an average speed of about eight knots. On arrival the skipper, who happened to be a friend of the owner, reported that his compass was so badly in need of adjustment as to be practically useless and that of the only three charts on board one was dated 1890!

The Diesel engine which gave such notable service in this instance was a four-cylinder

70 hp. Paxman-Ricardo unit and according to the skipper's testimony it ran faultlessly throughout, giving him and his crew the utmost confidence even at the height of the gale.

Two other recently launched British fishing boats of particular interest are the all-steel motor trawlers *British Columbia* and *Ala*. Both these boats are equipped with Ruston Hornsby Diesel engines, one of 310 hp. and the other of 150 hp.

The *British Columbia*, the larger of the two, is 100 ft. in length and carries a crew of twelve including the captain. The engine is a six-cylinder four stroke, direct reversing unit of 12½ inch bore by 15 inch stroke mounted amidships with the fish holds forward of it and the crew's quarters aft. Amongst the up to date features of the ship are a Marconi Echo Sounding Installation, comprehensive radio outfit and Electric lighting throughout with a flood-lit deck. On trials the *British Columbia* maintained a speed of 10 knots and gave a fuel consumption reading of .39 pints per bhp. hour.

The *Ala* is a smaller boat with a much less elaborate equipment. She carries a crew of only six and measures 75 feet long by 20 feet beam. Despite her size she is nevertheless a very seaworthy ship and can exceed nine knots for short periods.

Incidentally these two boats illustrate very clearly the changing outlook of the European Fishing industry. Sentiment still clings to the steam trawler and in England where coal is cheap, many larger vessels are still being built with steam propulsion gear. However, the lower running cost, smaller engine and bunkerage space and the correspondingly increased fish carrying capacity of the Diesel engined craft give them an undeniable superiority. Of the 190 trawlers now on order in England, Holland and Norway, 110 are to be Diesel powered, proof enough of the run of the tide.

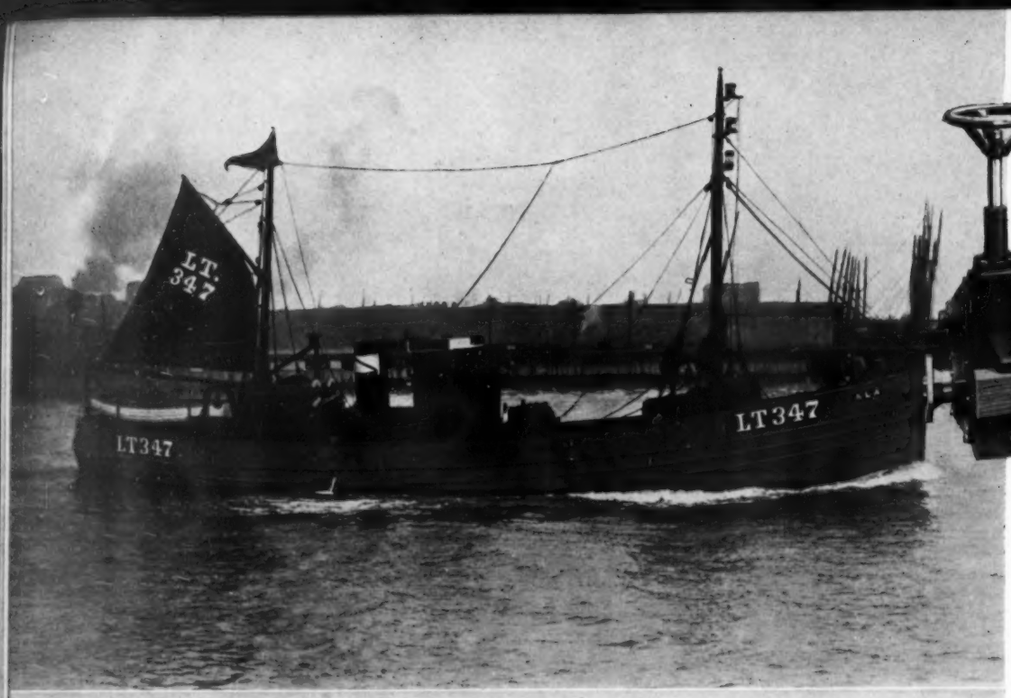
Another type of fishing boat for which Diesels are rapidly proving their suitability is the small auxiliary sailing vessels used for coastal trawling. Many of these boats were originally equipped with petrol-paraffin engines, but in the majority of cases the owners have found it worth their while to convert to heavy oil. Typical of this class of craft are the three Pittenweem boats, *Amber Queen, Sparkling Waters* and *Courageous*, all recently converted by the National Gas and Oil Engine Co., of Manchester. The largest, the *Amber Queen*, is now powered with a four-cylinder 37 hp. Diesel engine, whilst the other two have 28 hp. units. Some idea of the saving afforded by the conversion may be gained from the following figures supplied by the owner of the *Sparkling Waters* —

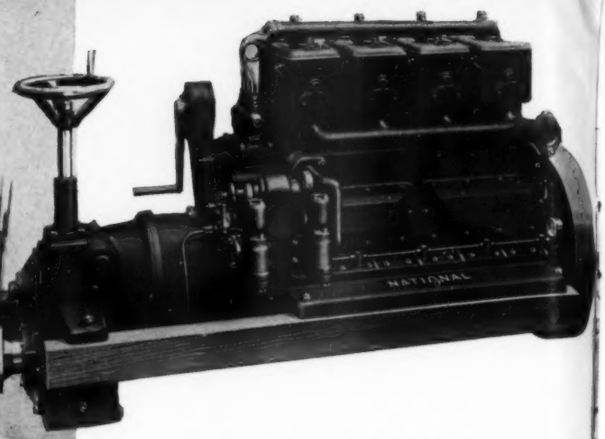
Running cost of 26/30 hp. Petrol Paraffin engine, per week	$8.80
Running cost of 27/30 hp. National Diesel, per week	4.00
Saving per week	$4.80

Turning now to developments among other classes of boat, the performance of the new Thames Motor tug *Rio* is well worth mentioning. Designed for either river or open sea duty and provided with lowering masts and a short funnel she was built by Henry Robb, Ltd., of Leith, Scotland, one of the oldest tug building firms in Great Britain.

She has a length of 80 ft. 6 ins. a beam of 20 ft. and is powered with a six-cylinder Ruston engine developing 310 bhp. at a normal speed of 300 rpm. The hull embodies a number of modern constructional features including a cast steel stern, cast steel stern-frame and a partly balanced rudder. There are two large cabins, one forward and one aft, heated by a

"Royal Princess" at anchor on the Thames.





Diesel engine as fitted to Pittenweem fishing boat "Amber Queen."

slow combustion store with boiler which is fitted in the forward cabin and circulates hot water to the radiators and to a heating coil below the grating of the steering shelter.

The normal duty of the *Rio* is to tow four spirit barges, making a gross load of 960 tons, from Thames Haven to wharfage some 45 miles up the river and in service she is attaining a speed of approximately four knots through the water when towing a full load.

The owners, the Union Lighterage Co., have just run some interesting tests of this, their latest acquisition in comparison with steam tugs. In these tests the Diesel engined boat came through with flying colors, definitely proving that she could do as much work as a steam tug at only a sixth of the running cost.

So far all the boats described have been intended for heavy duty purposes, but Diesel engines are steadily increasing their reputation among European builders of pleasure craft as well.

One particularly interesting new vessel of this type is the Thames Passenger boat *Royal Princess.* Previously all this class of shipping has been steam powered and only now have the owners come to appreciate the greater carrying capacity, the added cleanliness and lower running cost obtainable with Diesel propulsion.

Lowestoft trawler (all steel) "Ala" fitted with 150 bhp. Ruston-Hornsby oil-engine. All steel trawler "British Columbia" with a 310 bhp. Ruston engine leaving Grimsby docks. Thames tug "Rio" with a 310 bhp. Ruston engine on trials with spirit barges.

The *Royal Princess,* a 114 ft. boat, was built and launched in 10 weeks by the Rowledge Iron Works Co., Ltd., to the order of Captain A. Crouch, a well-known Thames character who has been operating pleasure boats on the river for the past 20 years. Owing to the shallowness of the Thames at low tide she is constructed with a tunnel stern hull the draught being as little as 3 ft. even when fully loaded. Accommodation is provided for 350 passengers and the engine, situated right aft is a five-cylinder scavenge pump two-stroke direct reversing Crossley unit rated at 125 hp. at 450 rpm.

The scavenging device on this type of engine consists of a pair of plungers which are arranged vertically in tandem at the forward end. They pump air at a pressure of 4 lbs. per sq.in. to a manifold common to all the cylinders.

During her trials the *Royal Princess* reached a speed of 10 knots and at full throttle the fuel consumption did not exceed five gallons per hour. The boat's normal cruising speed is about eight knots and this coming season when she commences duty on the 25-mile run from Greenwich to Richmond she will be called upon to make the return journey twice daily.

As regard yachts and cruisers the general trend is to rely more and more upon Diesel power and it is interesting to note that in Great Britain, easily the leading European country for marine Diesels, there are now actually more small high speed oil engines being manufactured than there are petrol and paraffin units. This is all the more remarkable when it is remembered that in 1928 there was only one make of British Diesel engine available for marine use with a crankshaft speed of over 800 rpm.

There are at present 29 makes of engine revving at over 1,000 rpm. of which Gardner, Gleniffer, Thornycroft, Paxman, Ruston and Allen are the best known names. Of these, Gardner's are no doubt the most popular, supplying as they do units of from 19 to 136 hp.

To give American readers some idea of British yacht design, here, then, are some facts and figures relating to the twin-screw Gardner-engined motor yacht *Jester,* built at the end of August, 1935, for W. T. Henderson, a noted British yachtsman, by James Silver, Ltd., of Rosneath, Dumbartonshire.

The boat is built for ocean cruising and is 56 feet long with a 4 ft. 10 in. draught. She is powered by two 4-cylinder electric starting engines of 38 hp. each, the normal speed at sea being nine knots.

The accommodation on board comprises a double state room with running hot and cold water, two single cabins similarly equipped, a large tiled bathroom and just about amidships a brightly furnished saloon. Forward of the saloon is the galley and the quarters for a crew of two seamen.

The *Jester* is a thoroughly seaworthy boat and, according to the owner's reports, even in the roughest weather the control station and cabins remain snug and dry. One of the best runs so far made was from Grimsby to Harwich, a distance of 170 miles at an average speed of eight knots. The fuel consumption on this occasion worked out at a little over five mpg. with a running cost of less than two cents per mile. The boat's total mileage covered to date is about 4,000 and on neither of the engines has any adjustment yet been found necessary—ample proof of the soundness of their design and workmanship.

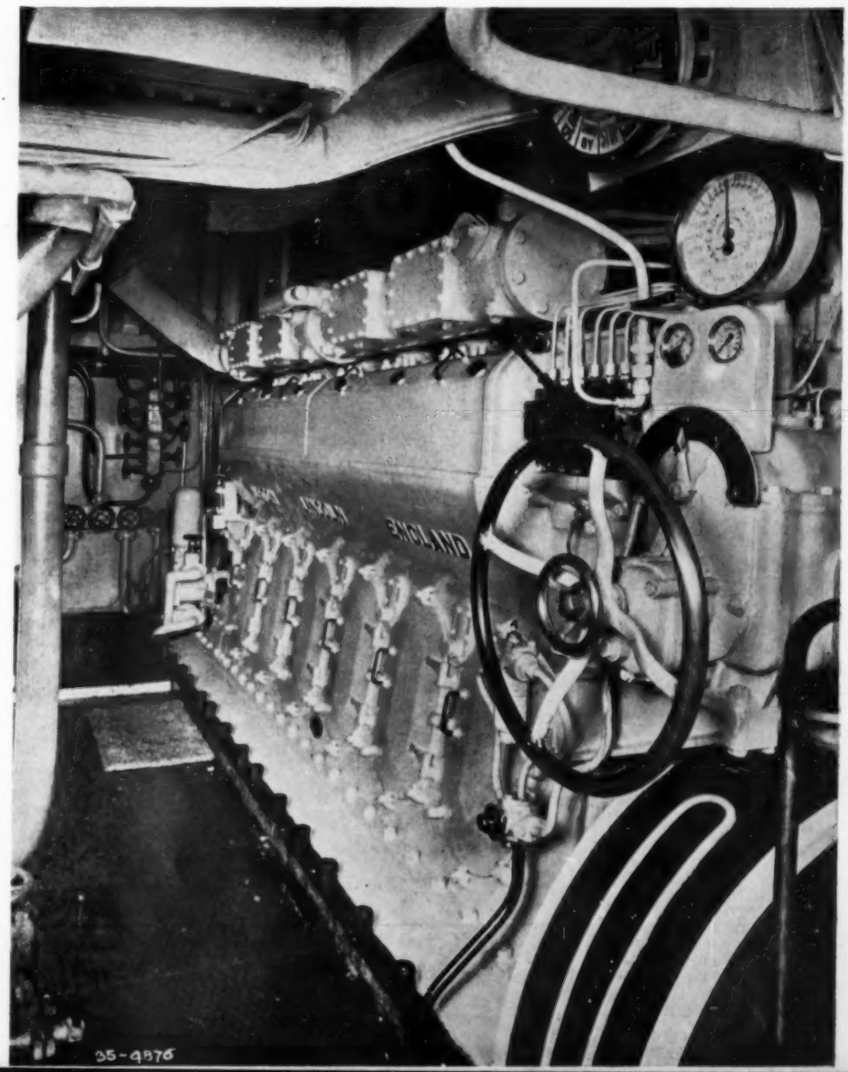
Just as this London Letter No. 3 was completed information was forthcoming that the English Electric Company, Ltd., has received an order from the Bermuda Electric Light, Power & Traction Company, Ltd., for a 3,500 bhp. mechanical injection, two-stroke cycle, pump scavenge, opposed piston, eight-cylinder, Diesel engine, running at 214 rpm. directly coupled to an "English Electric" alternator.

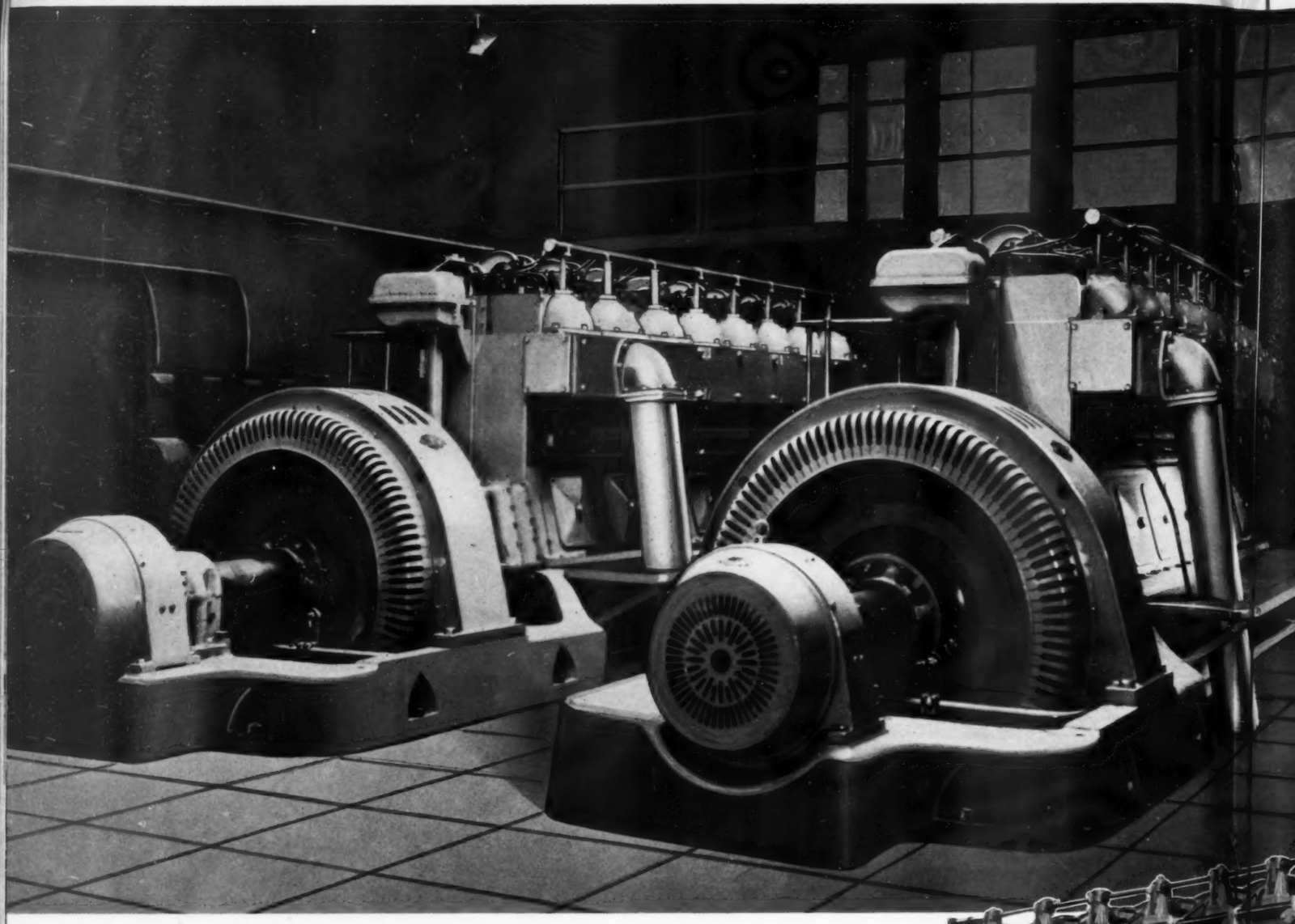
This repeat order will be the fifth Diesel engine of the "English Electric" Fullagar design installed in the Bermuda station, and will bring the total power to well over 10,000 bhp.

The new set will weigh approximately 275 tons. The engine will be manufactured by the company's Rugby Works and the alternator at their Stafford Works.

It is interesting to note that this will be the largest Diesel engine ever manufactured in Great Britain for industrial purposes, and furthermore, the 2,600 bhp. set installed by the English Electric Company in Bermuda about three years ago was at that time, also the largest Diesel engine built in this country for industrial purposes.

310 bhp. Ruston engine as fitted to the Thames tug "Rio."

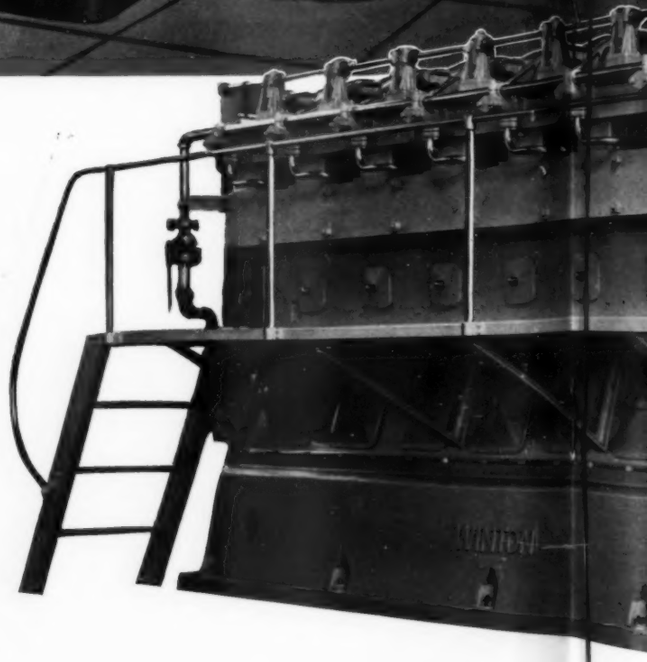




Showing Winton-Diesel engines in the plant of the Delaware Paper Mills, Inc. This modern installation demonstrates effectively how Winton power can be adapted to meet the varying needs of modernization.

●

Three-quarter front view of one of the two complete Winton-Diesel units installed in the Delaware Paper Mills, Inc., showing inlet side of the eight-cylinder engine direct connected to 480-volt, three-phase, 60-cycle generator and exciter.



Symbol of Economy and Dependability

WINTON ENGINES *Demonstrate Their* **ECONOMY** AND **FLEXIBI**

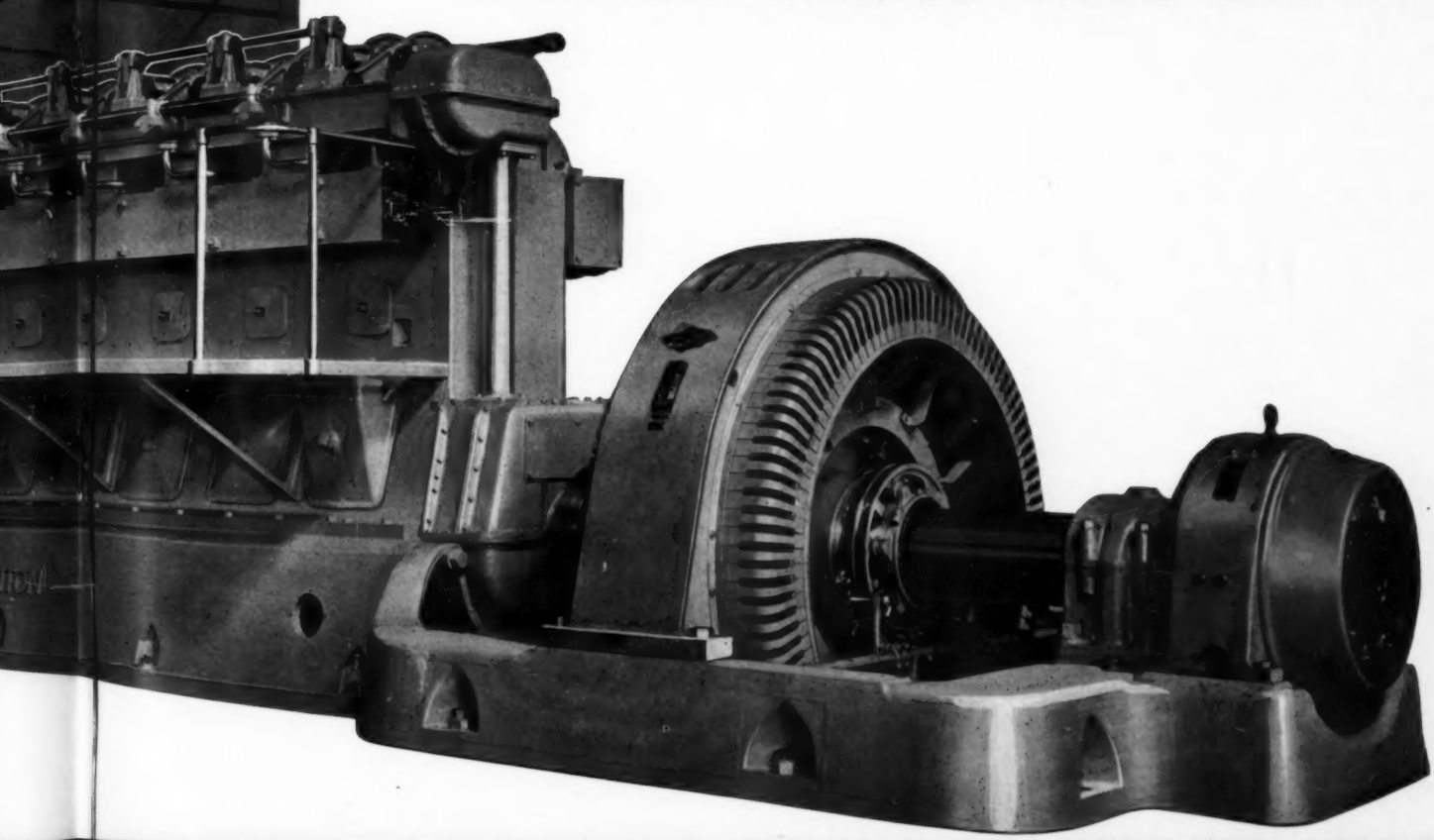
WINTON-DIESEL POWER

Meets the Need in

INDUSTRIAL MODERNIZATION

BECAUSE of their ability to synchronize economical dependability with all around service performance, Winton-Diesel engines are now supplying all necessary power at the Delaware Paper Mills, Inc., Wilmington, Delaware. The installation consists of two eight-cylinder engines, each developing 700 h.p. at 360 r.p.m., 485 k.w. with direct-connected generators and direct-connected exciters. These engines operate all auxiliary equipment such as beaters, grinders, pumps, and other electrical equipment connected with plant operation and furnish current for lighting. They also furnish the major portion of the hot water used for processing. The combined saving in generation and reclamation of cooling water temperatures, makes this a very profitable installation . . . typifying the manner in which Winton-Diesel power meets the need in industrial modernization.

WINTON ENGINE CORPORATION, Cleveland, Ohio, U. S. A.



FLEXIBILITY *in This* MODERN PAPER PLANT INSTALLATION

DIESELS for MAIN LINE FREIGHT SERVICE

THE year 1935 saw great development of the Diesel engine as applied to railroad service. The sleek, streamlined, trans-continental, Diesel express trains were featured by great metropolitan dailies and their speed runs recorded by news camera men for every neighborhood theater. Miniature Diesel electric passenger trains can be found in every toy store and such terms as "Zephyr," "Cannon Ball" and "Rebel" are public by-words of today. This, however, is only half the picture from the point of view of the railroad earnings statements. While not so breathtaking in speed or appearance and not so romantic in its service, the new main-line, Diesel-electric, freight locomotive recently introduced by Westinghouse is of vital interest to railroad men specifically and the public generally. The application of Diesel economy to the problem of rail freight is a necessary and logical sequence to the last ten years of progress in Diesel passenger and switching locomotives.

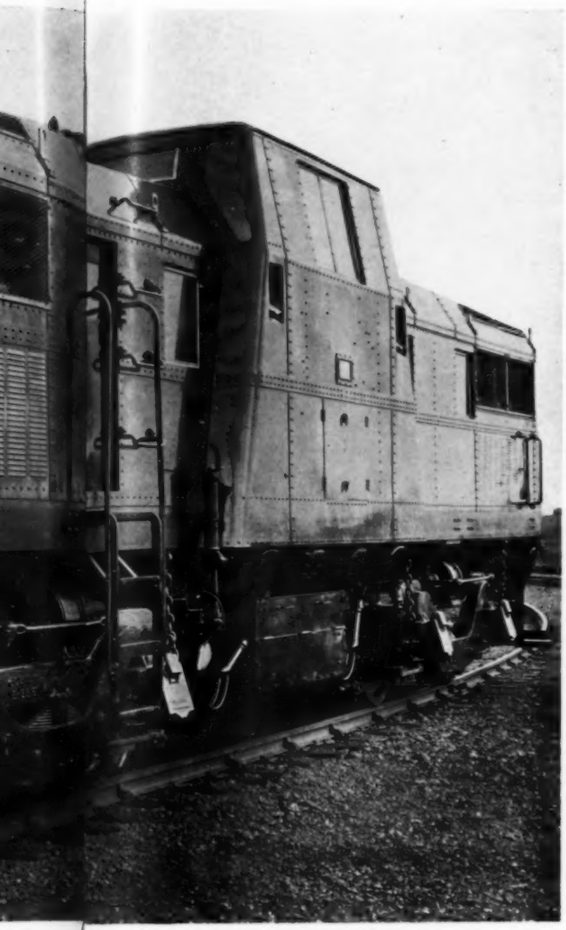
The Westinghouse Electric and Manufacturing Company have been among the leaders in adapting Diesel electric power to railroad service and, in developing this new 1,600 hp. 133-ton main-line freight locomotive, they set the following standards of construction:

1. Twin axle trucks without overload per wheel.
2. One man operation to reduce personnel expense.
3. Simple, durable construction for most severe freight service.
4. Accessibility of main and auxiliary drive for maintenance and overhaul.

Accordingly, we find an integral cast steel underframe supported by two swivel type, four-wheel trucks. The operator's cab is centrally located between two complete and duplicate power plants with auxiliary equipment. Tanks for 1,000 gallons of fuel oil and 170 gallons of lubricating oil are incorporated into this cast frame as well as sand boxes, draft gear housings and air ducts for traction motor ventilation. Similarly, the two trucks have cast steel frames and side equalization is accomplished by means of semi-elliptical springs. Hardened steel bushings protect all wearing surfaces.

The unit measures over all 52′ 11″ long by 10′ 2″ wide and the maximum height from rails is 14′ 1″. By raising the operator's cab slightly and slanting it at the top, visibility both over and along the sides of the end hooks is very satisfactory. The locomotive has a maximum speed of 50 mph. and a starting tractive effort at 30 per cent adhesion of 80,000 pounds.

The two Westinghouse Diesels mounted with auxiliaries at either end of the cab are rated at



800 hp. each at 900 rpm. They are of the solid injection, 12-cylinder, V-type and operate on a four-stroke cycle. Each engine drives a single bearing main generator whose armature is flanged and directly connected to the engine crankshaft with a flywheel interposed. (These generators serve as motors for starting the Diesels). The current from each generator drives two traction motors on each truck which in turn drive the wheels of the locomotive through spur gears and pinions.

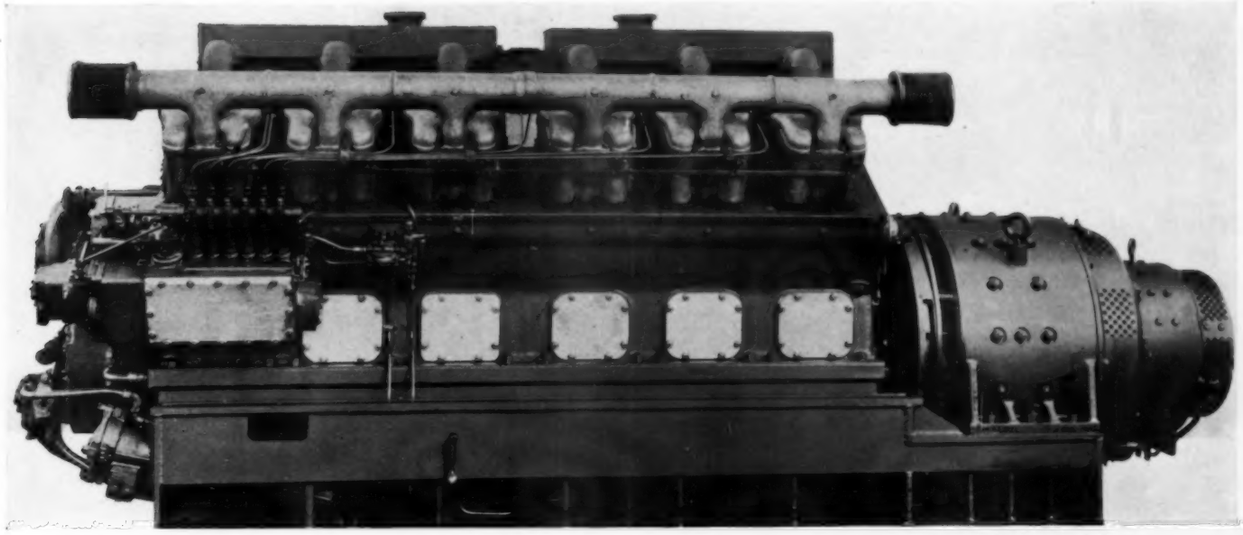
To provide the maximum operating flexibility, all controls are dual and the engineer can move from side to side without closing the throttle or losing a second's control of power, brakes, reversing or sanding, thus securing for himself at all times the best view of ground crew, tracks, and surrounding conditions.

It is common knowledge that when a locomotive starts from a dead stop with a heavy train the weight is unevenly distributed with the rear trucks taking a much greater load than those forward. Thus, the front drivers are not exerting the maximum amount of tractive effort of which they are capable. In this particular installation, foot buttons are provided which operate weight transfer compensating switches which insure maximum adhesion on all drivers when the greatest starting tractive effort is required. A further step toward flexibility is the operator's ability to run all four traction motors from either power plant in case of a forced or desired shutdown of the other Diesel and generator.

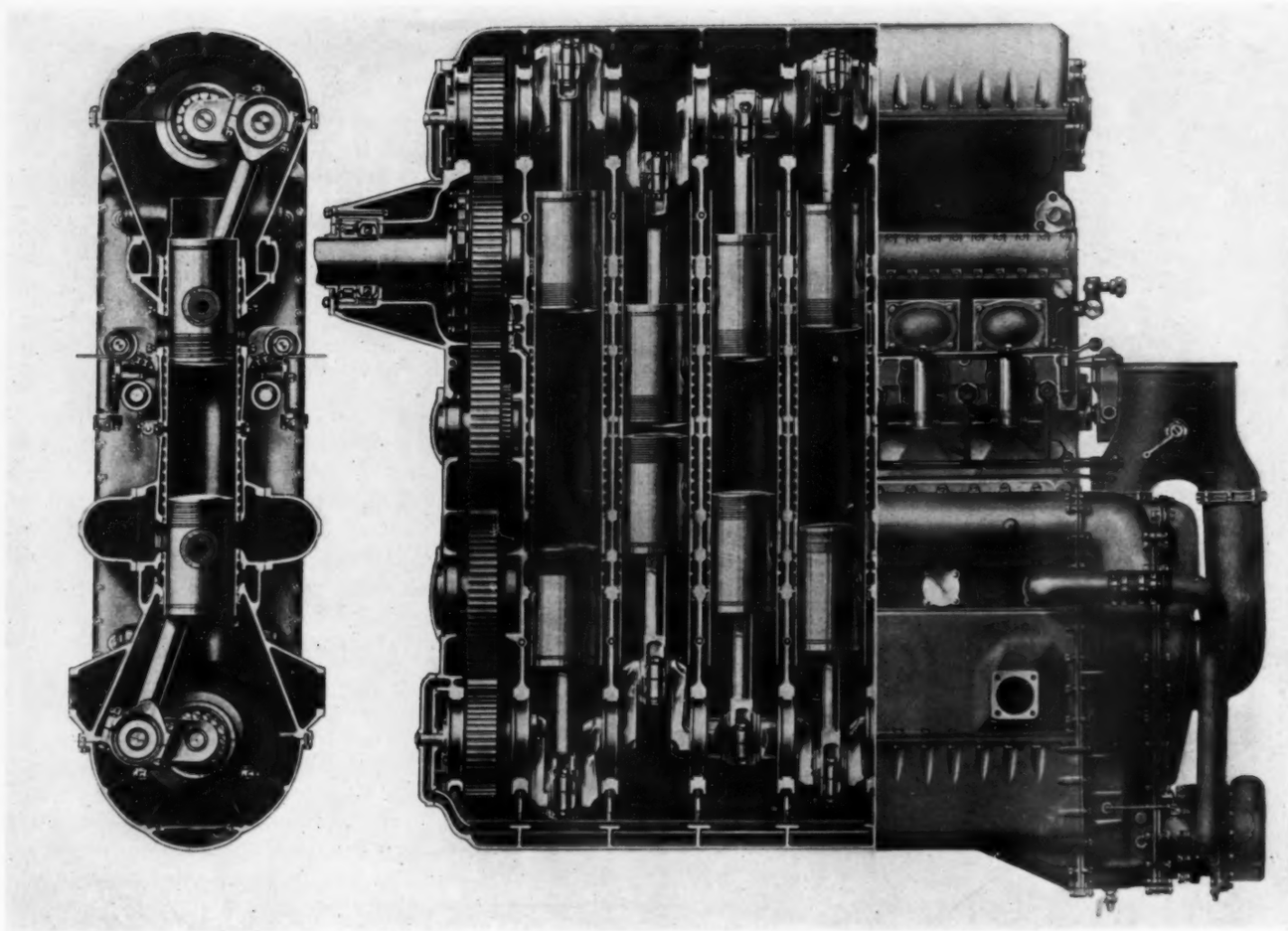
The hoods enclosing the Diesels are sufficiently roomy that ample space is provided for general maintenance and the light-weight pistons can be removed by hand without the necessity of a tackle. Valve grinding and ring renewal are thus easily accomplished. Also, the main and auxiliary generators, all control equipment, compressors, filters and blowers, can receive ordinary maintenance without removing the top or side hood coverings.

Obviously, with a Diesel locomotive there are no ashes to dump, no water tank to fill, no fire box or boilers to clean and refueling is much less frequent. In comparing costs of Diesel versus steam, there are real economies over and above fuel cost in the attendant elimination of ash pits, coal chutes, water tanks, boiler wash equipment and many other facilities necessary for steam operation. These must be considered to obtain a true picture of Diesel economy as applied to railroads.

Westinghouse may be justly proud of their latest contribution to the important business of moving the country's produce from growers and manufacturers to consumers. It is such progress that has made this country great and the Diesel is adding one more active chapter to our industrial history.



America's first Diesel Electric, Main Line, Freight Locomotive on twin axle, swivel trucks and one of its two Westinghouse Diesel generator units.



Junkers "Jumo" 4 — sectional views.

DIESEL AIRCRAFT ENGINES IN GERMANY

By PAUL H. WILKINSON

THE best-known Diesel aircraft engines in Germany are the Junkers *Jumo* 4 and *Jumo* 5, manufactured by Junkers Motorenbau G.m.b.H. of Dessau. Not only has Junkers the advantage of the knowledge accumulated during many years of painstaking work with this type of engine, but they are also in the fortunate position of being able to test their engines in their own airplanes. A good many Junkers airplanes are used by Deutsche Lufthansa, and consequently performance figures and costs under actual airline operation conditions are available for their guidance.

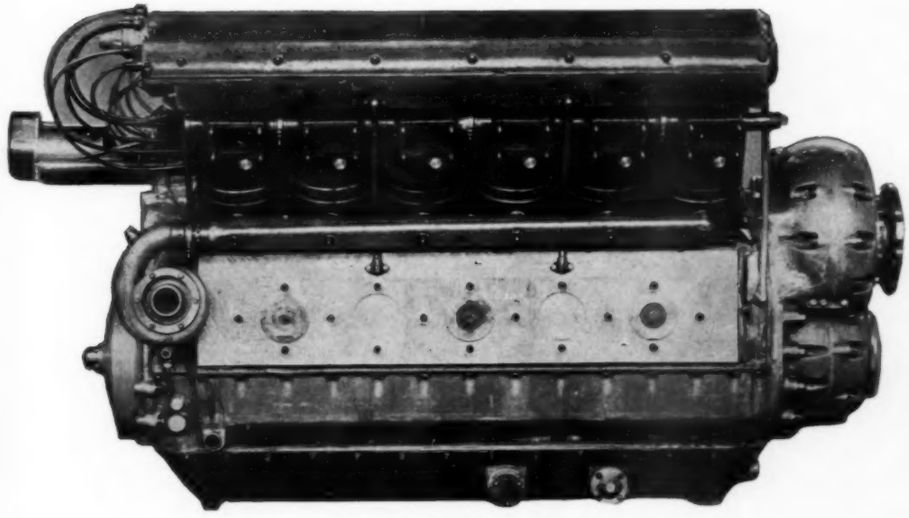
Junkers engines have been installed on various types of airplanes. The illustration on the opposite page shows a Junkers Ju 52/3m seventeen-passenger airliner which is powered with three 550 hp. *Jumo* 5 engines. This airplane is of modern, all-metal construction, and has a gross weight of 22,046 lbs. Its flight range, cruising at 162 mph. at 8,200 ft., is 685 miles. It carries 362 gals. of Diesel fuel.

A seaplane version of the Junkers Ju 52/3m was exhibited at the Paris Salon in 1934, where it excited much favorable comment.

Another interesting installation, this time of the larger engine, is the 750 hp. *Jumo* 4. Four of these engines enable the giant Junkers G-38, type D-2000 airliner to carry thirty-four passengers and a crew of seven at a cruising speed of 129 mph. The G-38 has a wing span of 144 ft. and an overall length of 76 ft. Its gross weight is 52,911 lbs. It carries 898 gals. of Diesel fuel, sufficient for a flight of 930 miles. Two of these airliners, the *Deutschland* and the *Hindenburg*, are in regular service between Berlin, Copenhagen and Malmo, Sweden.

The Junkers *Jumo* 4 and *Jumo* 5 engines are

Junkers JU 52/3m airliner.



Mercedes-Benz OF-2, side view.

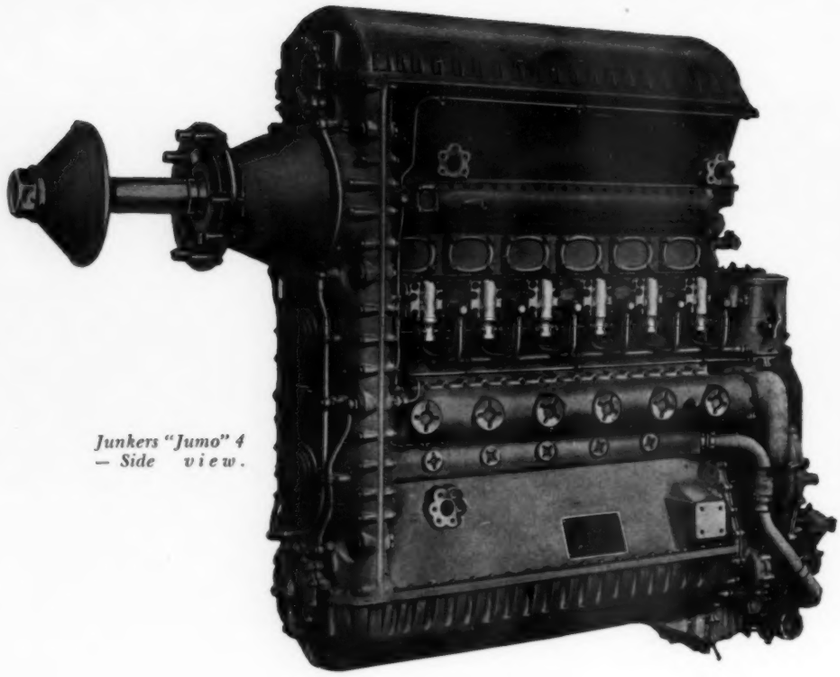
similar in construction. An exterior view of the *Jumo* 4 is illustrated, and sectional views are also illustrated. The bore and stroke are 4.72 ins. and 2 x 8.27 ins. respectively, and the displacement is 1,745 cu.ins. It is rated at 750 hp. at 1,720 rpm. at 8,200 ft. Its weight is 1,653 lbs., or 2.20 lbs. per hp.

The smaller engine, the *Jumo* 5, is rated at 550 hp. at 2,100 rpm. at 8,200 ft. and weighs 1,124 lbs., or 2.04 lbs. per hp. Its bore and stroke are 4.13 ins. and 2 x 6.30 ins. respectively, giving it a displacement of 1,014 cu.ins.

Although this type of engine is commonly called a six-cylinder engine, it has virtually twelve cylinders, based on the number of pistons. It is of the two-cycle, vertically opposed, water-cooled type. A gear-driven, single-stage compressor, geared at 7.0: 1, is used for scavenging and supercharging. The inlet ports are at the lower end of the cylinder, and the exhaust ports are at the upper end. A dual injection system is used, consisting of two independent pumps and four injectors for each cylinder. The injection pressure is 8,820 lbs. per sq.in.

Another firm in Germany which has had considerable experience with Diesel aircraft engines, is Daimler-Benz A.G. of Stuttgart. The Mercedes-Benz OF-2, which was type-tested in 1932, is shown herewith. It is a four-cycle, twelve-cylinder, 60° vee, water-cooled engine which is rated at 720 hp. at 1,720 rpm. at 3,280 ft. Its maximum output, with smokeless exhaust, is 800 hp. at 1,790 rpm. The bore and stroke are 6.50 ins. and 8.27 ins. respectively, giving it a displacement of 3,288 cu.ins.

The Bosch fuel injection system on this engine, using multi-element pumps, operates at a pressure of 1,400 lbs. per sq.in., which is quite low for Diesel operation and is made possible by the use of the Daimler-Benz pre-combustion chamber. The compression ratio is 15.0: 1. The compressed air used for starting is supplied by two compressors on the engine. A spur reduction gear, with ratio of 1.73: 1, is used for the propeller drive.



Junkers "Jumo" 4 — Side view.

The latest product of the factory is the Mercedes-Benz LOF-6, which is strictly an airship engine. It is somewhat similar in appearance to the railcar engines built by Daimler-Benz, but is relatively lighter and has a much greater power output. An outstanding feature of this new four-cycle engine is the use of sixteen water-cooled cylinders arranged in two banks at 50 degrees, which makes it a very sturdy and compact engine. It has a bore and stroke of 6.89 ins. and 9.05 ins. respectively, and a displacement of 5,401 cu.ins., which makes it the largest Diesel aircraft engine in the world.

The LOF-6 is rated at 1,100 hp. at 1,500 rpm. and weighs approximately 4,320 lbs., or 3.93 lbs. per hp. The Bosch fuel injection system and Daimler-Benz pre-combustion chamber are also used on this engine. As previously mentioned in these columns, four of these engines are installed on the new Zeppelin LZ-129, the *Hindenburg*.

Other firms in Germany are working on Diesel aircraft engines of 1,100 hp. and up.

Junkers G-38 airliner, "Hindenburg."

Dieselization of industrial locomotives is well visualized by this new unit recently announced by the Euclid Road Machinery Co.

DIESELIZING THE INDUSTRIAL LOCOMOTIVE

THE Diesel engine has quietly but definitely replaced all other forms of motive power for light railroad and industrial plant switching locomotives — and logically so. The Diesel engine has proven itself in actual service to possess better lugging ability, much better economy in operation and low maintenance costs.

A recent addition to the Diesel industrial locomotives offered industry was announced a few weeks ago by the Railway Transportation division of the Euclid Road Machinery Company. They are built in four-wheel units of from 35 to 55 tons weight each, which may be operated singly, or in multiples of two by one engineer from either cab, as loads may require. The maximum tractive efforts available at starting range from 21,000 lbs. for the 35-ton single unit to 66,000 lbs. for the multiple 110-ton locomotive made up of two 55-ton single units. For switching service, maximum speeds available under light load range from 22 to 26 miles per hour.

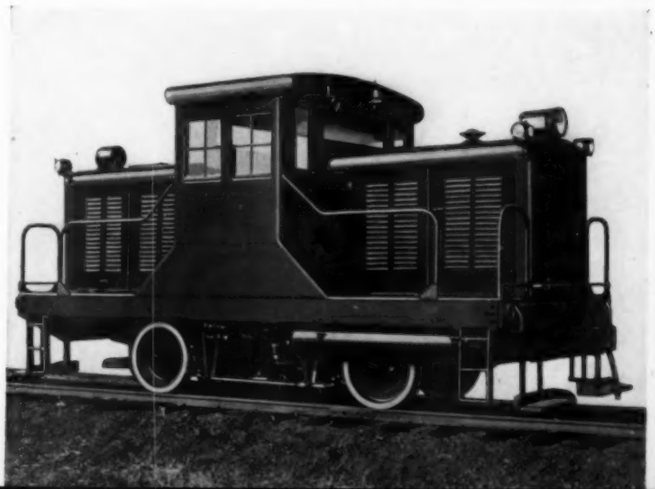
The 35- and 55-ton Euclid Diesel-Electric Locomotive is illustrated herewith. The standard locomotive is the 55-ton model. The 35-ton unit is made available by eliminating one engine and generator and by using lighter structural steel sections. The dummy hood is provided for balanced appearance.

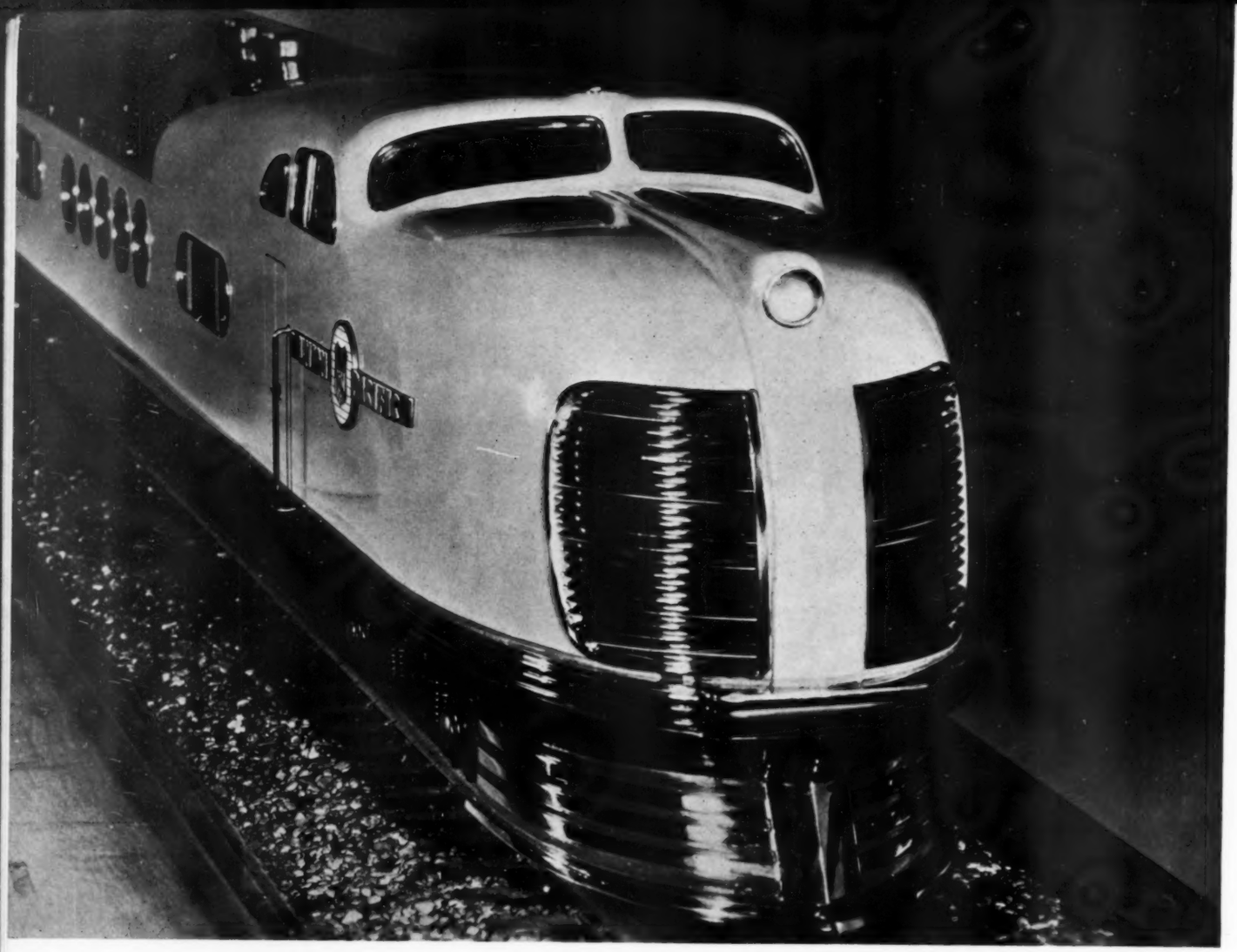
Main drive is accomplished through two fully enclosed double reduction axles with 10-1 gear ratio positively driven from a single heavy-duty traction motor through automotive-type drive shafts of special heavy-duty construction.

Power units are located at either end and consist of a Hercules Diesel engine and a direct-current generator unit directly connected and mounted complete with radiator, fuel tank, air-compressor and hood so as to be quickly and easily removable for repair or replacement. The power units are placed on heavy, flexible rubber mountings to eliminate the transfer of shock and vibration from the locomotive chassis. The 35-ton model has a single power unit with a dummy hood at the opposite end for balance.

The locomotive chassis is mounted on the axles by means of four large resilient rubber members, one at each end of both axles. Driving torque is resisted by heavy arms, one for each axle, extending from the axle to the end sills of the chassis.

Special attention is given the cab and control location to provide clear vision from the single operating station when running either forward or backward.





CITY OF DENVER

A SAVING of a business day in passenger transportation between Chicago and Denver will result from the inauguration of streamline train service by the Union Pacific Railroad and the Chicago & North Western Railway between the Colorado capital and Chicago, a reduction of more than nine hours from the present fastest schedule. To accomplish this the construction of two streamliners, each of 10 cars, with 2,400 hp. Winton Diesel driven units, for 16-hour daily service between those points, was approved by the Union Pacific board of directors at a recent meeting, it was announced by Carl R. Gray, president of the Union Pacific, and Fred W. Sargent, president of the Chicago & North Western Railway.

The two additional streamliners, when completed, will give the Union Pacific a fleet of six such trains. Five streamliners will operate between Chicago and Denver, Portland, San Francisco and Los Angeles, respectively. The other train, the first streamline train built in America, a 3-car unit, operates between Kansas City, Mo., and Salina, Kans., a roundtrip, daily daylight run. The two new trains for the Denver service will be called "The City of Denver."

The "Streamliner – City of Denver" will leave Chicago and Denver every day in the late afternoon and arrive at the two terminals, respectively, the following morning. Both arrival at and departure from Chicago will be at an hour to allow for ample time to make connections to and from all eastern cities.

Contract, it was announced, has been awarded for the new trains to Pullman-Standard Car Manufacturing Company in Chicago and construction has already started. The Diesel electric power plant will be built by Electro-Motive Corporation of Chicago, subsidiary of General Motors.

"The power cars of the new trains will be built of Cor-ten steel, a new high tensile chrome alloy steel developed by the United States Steel Corporation," said Mr. Gray. "The power plant of each train will consist of two 1,200 hp. Diesel engines, directly connected to generators providing current for the electric motors on each truck of the power cars. A separate car will house each engine, the cars being in tandem and so arranged that both engines, or either individually, can be operated

. . . . *And now please turn to page 42*

A DIESEL LIFEBOAT

TO meet successfully extreme conditions of sea, storm and maritime emergency, the United States Coast Guard have specified Buda Diesel drive in their new life boats, *Invincible* and *Triumph*. These craft are the largest of their kind ever built and, in addition to their dependable Diesels below decks, have incorporated most complete and elaborate equipment for the hazardous routine of saving life off shore.

Throughout the many centuries in which man has been pitting his strength, knowledge and ships against the sea, there has existed a very real need for large motor life boats capable of withstanding mountainous seas and dirty weather without impairment of maneuverability or operation. The answer to this need comes naturally from the many years of experience and meritorious service rendered by this nation's Coast Guard Service in the form of this new design.

The vessels are 52 ft. in length, 6 ft. in draft and have a displacement of 50 tons. To facilitate rescue operations, a flush deck was chosen so that in addition to quarters for over one hundred persons below, it is possible to accommodate another hundred more on the top side. Moreover, the comfort as well as the safety of survivors has been guaranteed by means of a heating system of the combined hot water, hot air and forced circulation type. This particular feature is certainly most essential since the majority of rescues are effected in bitter zero weather and suffering from exposure after leaving a ship in distress must be eliminated in so far as it is physically possible.

Obviously the hulls are of exceptionally rugged construction and are subdivided into watertight compartments any two of which may be flooded without danger of the boats sinking. Beaching when necessary can be accomplished without injury to propellers or rudders which are amply protected by heavy bronze skegs.

Complete navigating equipment consists of the usual modern instruments and of course includes two way radio apparatus, powerful searchlights and signal horns. All of these operating and navigational devices are protected by the pilothouse with a duplicate system abaft the wheelhouse on the bridge. The disposition of outboard lines and other customary life saving gear guarantees most efficient and effective service.

The Diesel in each boat is a six-cylinder, 150 hp. engine of regular Buda design and perhaps the most noteworthy feature is the closed system of cooling. Fresh water is used as the cooling medium and is circulated through a heat exchanger where it is cooled by sea water flowing from a pump on the flywheel end of the engine crankshaft. In case of emergency it is possible to circulate sea water directly to the cylinder block should the fresh water be lost. This cooling method is rapidly coming into increased favor for salt water Diesel operation. Electrical power is supplied by Diesel auxiliaries.

It is evident that these new additions to the Coast Guard Fleet are the last word in mechanical equipment and efficiency and it is only fitting that the modern marine Diesel should be selected for economical, safe and dependable power.

While the *Invincible* is stationed at Sandy Hook and the *Triumph* at the mouth of the Columbia River and both are designed to operate out of designated stations, they are provided with the necessary equipment for long range cruising. Thus the country is to be congratulated upon these latest elements in the national maritime safety and rescue service.

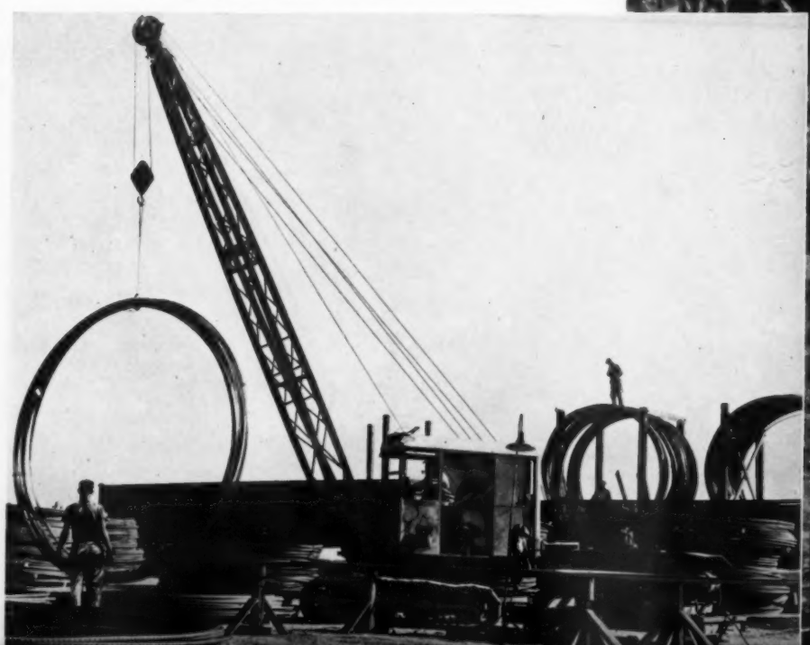
Coast Guard lifeboat "Invincible" which accommodates 30 passengers comfortably below deck, 50 in an emergency

Ah-h-h! Here is something in Diesel trucks: First load of bulk cement being delivered on the job by Triangle Rock & Gravel Co. to Aqueduct Construction Co. sector of the great $226,000,000 Colorado River Aqueduct, out in the California desert not far from Rice. "World's greatest Diesel dump truck," the "Generals" of the various concerns producing it said as they admired it on its initial trip. A Cummins 125 hp. Diesel engine, Heil hoist, Webertrailer, General tires, Sterling truck, Consolidated Steel Corp. all joined hands in producing this job. Two of them were driven out from Milwaukee and put on the job here on December 5 last. On the run the engines made 9.75 miles per gallon of 27 plus Diesel fuel, averaging 33 miles per hour driving time. Four companies checked the blue prints before construction started, and manufacturers believe they have the answer to bulk handling of cement and such products in this truck. Two trucks carry a carload of cement, or 21 to 25 tons per load.

ACTIVE MOBILE DIESELS

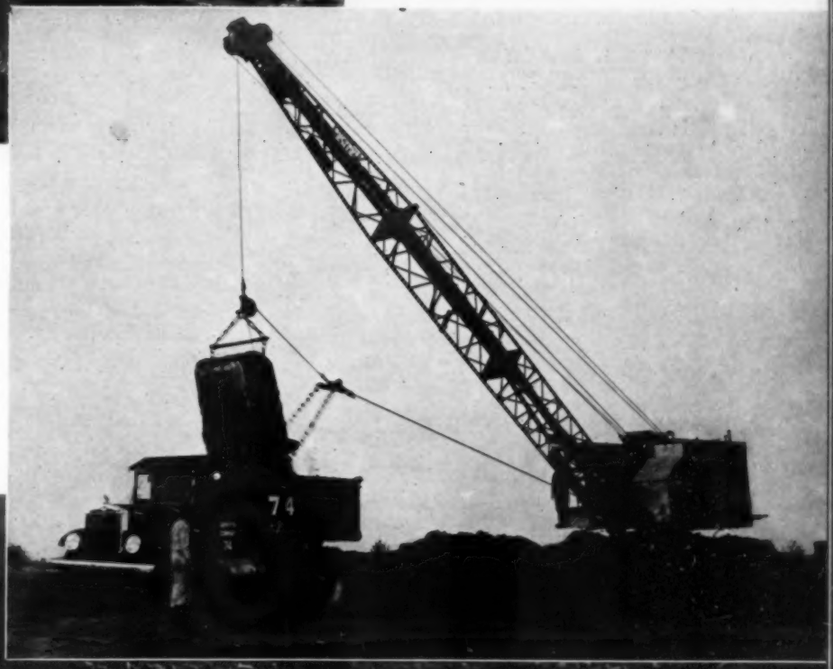
By F. HAL HIGGINS

Down to Bedrock at Bonneville: Bucyrus-Erie 43-B Dragline powered by a Buda Diesel engine Loading Trucks while 50 Hardrock drillers work furiously to complete the excavation ahead of the concrete force, which is starting to pour at one end of the excavation. This Diesel-powered dragline has made a great record here for Columbia Construction Co., which is building the Bonneville Dam.



Metropolitan Water District's new Waukesha-Hesselman motored Lorain 37 stacking and loading bundles of steel reinforcing rods after they have been welded into rings for reinforcing the concrete siphon and conduit sections of the 241-mile Colorado River Aqueduct. Each load averages about 2½-tons, some 75 to 125 tons being handled per day. "Swell little rig; if it ever went out of business, we'd have to shut down," declared the superintendent. "No trouble; bought a month ago; burns Diesel fuel."

Left — Diesel Builds Track for **Dobbin Training:** *Race track being constructed by Norman Church for training his stable of racing horses near San Jose, Calif. Earl Wheple, contractor, is moving the earth for the new track with this Hercules Diesel powered Cletrac 80, which is completing the job in record time.*



Right — Griffith's old veteran Atlas Diesel-powered Bucyrus-Erie dragline in a new hero role on the great Calalco dam that is to be a reservoir for the storage of the water brought to the Metropolitan Water District of Los Angeles with the completion of the 241-mile Colorado River Aqueduct. Some 25 trucks are hauling from this dragline and three Twin City oil engine-powered Northwest shovels in an operation spread over six or eight square miles area. This 2-yard buck swings at the end of a 60' boom; 30 gallons of 27 plus Diesel fuel are burned per 8-hour shift. Operators figure this veteran Diesel has worked close to 30,000 hours.

OBERLIN, OHIO

By FRANK E. CRAIG, *Plant Manager*

As in many other communities throughout the nation, the citizens of Oberlin, Ohio, finally exhausted their patience with the high rates of the public utility power company serving them. Accordingly, on November 8, 1932, at a general election, they voiced their protest in the form of an authorization to the city officials to build a Diesel municipal-electric plant. A controversy with the utility immediately arose and this plan was held up by the courts for over a year.

Finally, on December 27, 1933, the plant was begun and first went into operation on July 19, 1934. Since that date, the transfer to municipal power has been effected to include 93 per cent of all meters, the remaining 7 per cent comprising Ohio Electric employees, utility stockholders and others who, for business reasons, do not feel free to avail themselves of *lower* electric rates. Even this small number is steadily diminishing.

The cost of the new venture amounted to $240,000 which includes plant equipment, distributing lines and equipment, engineering costs and all incidentals. This was met by a quarter of a million dollar bond issue. In using this money, the city council men made a careful survey of possible equipment in order to secure maximum economy and durability over a long period of years.

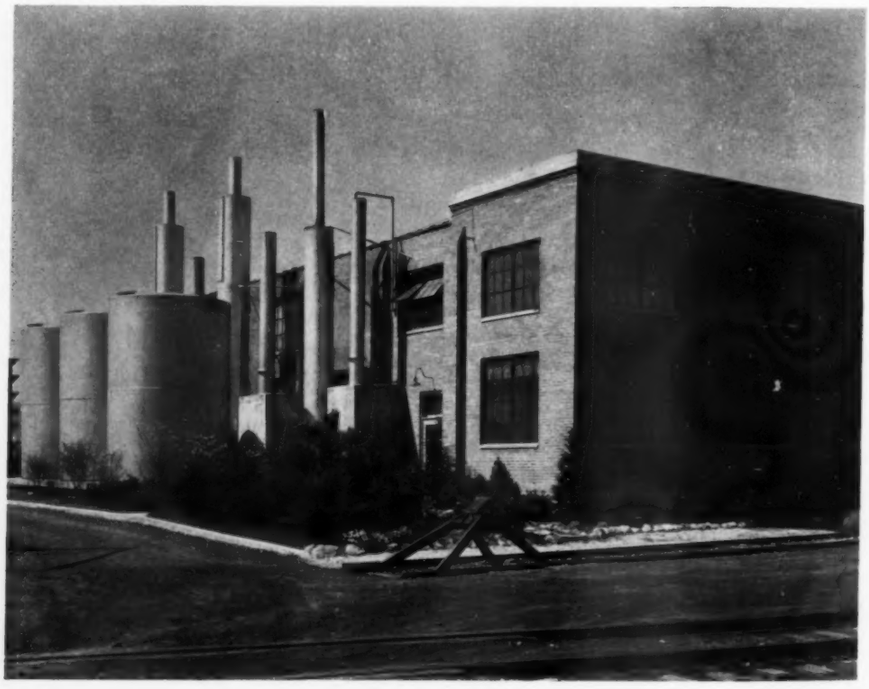
The Diesels finally selected were three Fairbanks-Morse direct connected to Fairbanks-Morse 2,400-volt alternators and exciters. The engines are of the pump scavenging, oil cooled piston type, two of which are rated at 875 hp. at 300 rpm. and the third at 600 hp. at 400 rpm. Auxiliary equipment includes Nugent fuel oil filters, Woodward governors, Alnor pyrometers, a Hydroil centrifuge and American air filters.

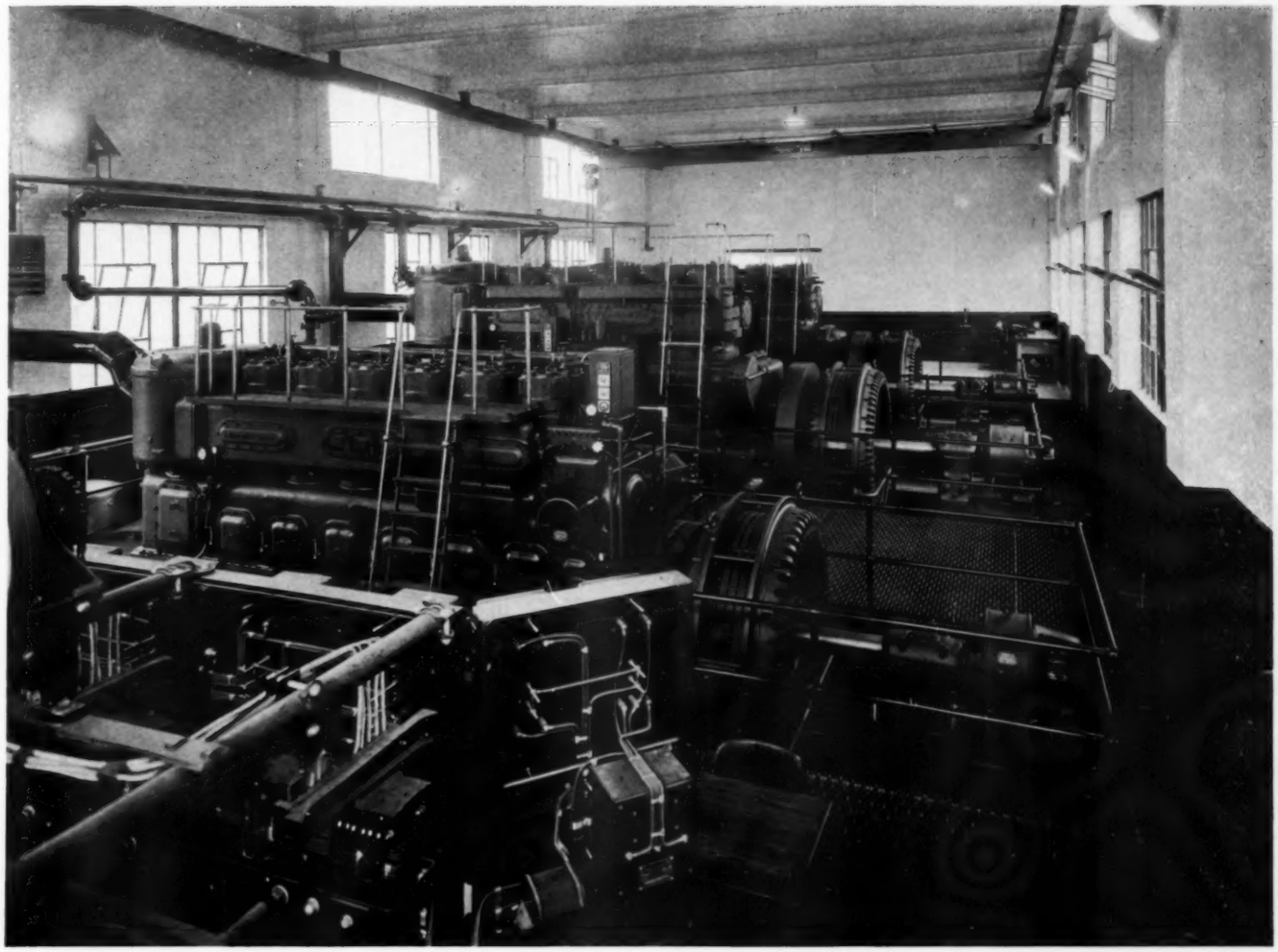
On the basis of power formerly drawn from the utility, two of the Diesel generator sets will suffice for the present leaving one unit for standby service and increase in load in the future. In addition, the city has provided facilities for the installation of a fourth engine since it is expected that a healthy and continuous growth will take place in the business.

Individual day tanks for each of the three Diesels are fed by gravity from three 10,000-gallon main storage tanks. Fuel oil is transferred from tank cars to these latter by means of an electric rotary pump operating with a two-inch line. Up to December, 1935, the plant has generated 3,171,600 kilowatt hours of power using 272,070 gallons of fuel oil or a production of 11.6 kwhr. per gallon. This means a fuel oil cost of 0.43 cents per kwhr. with fuel at five cents a gallon.

City Manager Zahms reports that there can be no doubt as to the advisability of the new Diesel municipal plant. With only 94 meters

Hereunder is a view of the municipal power plant at Oberlin, Ohio, showing the fuel tanks and Maxim silencers. To the left is a photograph of City Manager Victor Zahms who is so enthusiastic about the earning ability of his municipal Diesel plant.





Interior of the Oberlin municipal Diesel power plant showing the three Fairbanks-Morse Diesel engines with ample room in the background for additions to the plant as need requires.

on the line in September, 1934, the total mounted to 1268 in August, 1935, or an increase of 1174 in a little over a year. Total meter collections for the first thirteen months amounted to $54,232.10. Deducting all expenses of $31,577.75 leaves a net operating profit to the community of $22,654.35 or almost 10 per cent on the original investment. In these days this is certainly worthy of serious thought on the part of all taxpayers. A major item of necessary expense which will be eliminated in years to follow is publicity and business promotion. Henceforth the yearly profit will be increased by some $1,600 which was necessarily spent to get the ball rolling.

In order to insure that the constancy of the frequency and time keeping qualities of the service supplied to the customer was equal to or better than that provided by the privately owned company, automatic frequency and load control was installed to supplement the normal speed regulation of the Woodward governors. This control system is of the Leeds & Northrup type and corrects for frequency changes caused by changes in the customer load. It automatically checks the system time against that shown by a Warren Telechron master clock and both records and indicates any errors. The time error indicator also causes the control to adjust the frequency and correct for them by automatically changing the governor setting.

Time signals direct from Arlington are checked by a special radio receiver, and clock readings are recorded every hour except 9:00 and 11:00, A.M. and P.M. Past performance has shown that this automatic control maintains the synchronous time within ¼ of a second over a 24-hour period, thereby giving the Oberlin plant a record which is obtained by very few power systems. This control system is also equipped to provide automatic load distribution among units proportionate to their various capacities.

The method of handling the engine jacket cooling water is also quite interesting, a double-circuit system was chosen. Raw water is passed over a tower and through heat exchangers by a centrifugal pump. Such small quantities of make up water as are required are taken from the city main.

At the same time the pure jacket water is forced through the heat exchangers and jackets by a second centrifugal pump. For both the raw and jacket water system standby pumps . . . . *And now please turn to page 40*

Courtesy of Keystone View Company

DIESEL SAVES A LIFE

MRS. JOHN HEFT, an Alaskan colonist from Michigan, is convalescing in the hospital at Ancnorage after undergoing an operation for appendicitis, and will soon be back at her task of making a home in a wilderness. But there's more to the story than that.

When this pioneer was stricken, muddy trails had isolated Matanuska valley, and heavy rain was beating down on the cabin roof. The woman's distraught husband waded to the valley headquarters. His wife must be hurried to the railroad at Palmer, and then to Anchorage where an operation could be performed. But how to get to Palmer? Surely no horse, no vehicle could travel those miles of deep mire.

And then they thought of the Diesel tractors. A large fleet of these "Caterpillars" were machines-of-all-work in the settlement; logging, powering the farm tasks, moving houses and aiding construction. Why not hook one of these to a sledge, and get through to Palmer that way?

It was only a matter of minutes before the appendicitis victim was placed upon the quilt-padded sledge. Probably the world's queerest ambulance, the roaring track-type Diesel tractor, pulling the heavy sled, began its race with Death. The sledge runners were often deep in oozy mire, but the tractor "stayed on top" and kept its steady course toward Palmer. The first leg of the trip was soon completed. Mrs. Heft was given emergency attention at Palmer, placed aboard the next train and rushed to Anchorage where a surgeon and waiting staff took charge immediately upon her arrival.

Informed that the operation had been successful, Mrs. Heft's anxious husband, who had ministered to his stricken wife on the sledge, had just one thing to say as he sighed in relief: "We sure owe a debt to the Diesel!"

The next day, the tractor rejoined its fellows and was plugging away at its routine and varied jobs — a modest hero. It is of the stuff these sturdy Matanuskan colonists are made of. This Diesel and its twelve brother tractors have few hours of rest as they help the pioneers through their first Alaskan winter. But pioneering is nothing new to machines of this type. They've been in the vanguard of almost every colonization movement in the world for the last twenty-five years. They're used to it.

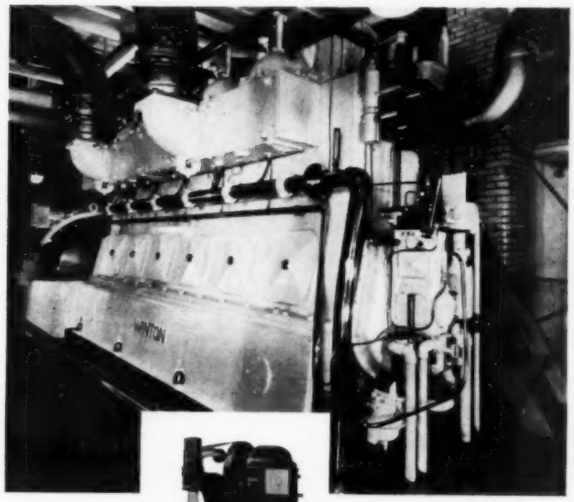
Sharples *in the* Singer Building

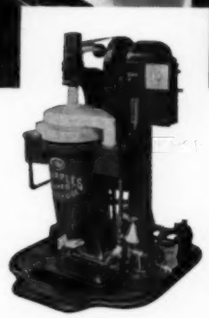
America's Pioneer Tower uses a SHARPLES En Bloc Oil Purifier to purify the lubricating oil for its Winton Diesel.

Other prominent New York buildings operating Sharples Oil Purifiers include The Hotel New Yorker, No. 1 Park Avenue, and Macy's Store.

A Sharples Oil Purifier protects the engine, and effects real savings—in oil consumption—and reduction in maintenance costs.

Sharples Super Centrifuges are available in sizes and designs to meet all requirements.





THE SHARPLES SPECIALTY CO.
2304 Westmoreland Street, Phila., Pa.

SHARPLES

Centrifugal Engineers

OBERLIN, OHIO, PLANT

. . . . *Continued from page 37* . . . .

are installed although at certain periods when all three engines may be in operation these standby units are called into regular service. These pumps are located in the basement and so are the heat exchangers.

It is interesting and enlightening to study the financial report for the first eleven months operation of this plant as provided from the actual records of the superintendent's office.

September, 1934, showed 94 meters installed. August, 1935, showed 1,268 meters installed. An increase of 1,174 meters.

Total meter collections	$54,232.10

EXPENSES

Office	$ 528.47
Salaries	9,924.00
Fuel oil	11,400.56
Lubricating oil	1,850.49
Plant expenses including changes required due to improvements over installation	1,851.27
Stock room and truck	514.41
Line expenses	945.05
Maintenance to line	467.59
Transformers	308.05
Services	291.16
Service calls and meter reading	346.94
Meters	37.26
Advertising and business promotion	1,609.26
Insurance	1,235.48
Misc. expenses	227.76
Actual operating expenses	$31,577.75
Showing an operating profit of	$22,654.35

This profit was accomplished in spite of the low competitive electric rates which are given out as follows:

RESIDENCE, COMMERCIAL, POWER

First	20 kwhr. per month	.05	per kwhr.
Next	30 kwhr. per month	.04	per kwhr.
Next	150 kwhr. per month	.035	per kwhr.
Next	800 kwhr. per month	.03	per kwhr.
Over	1,000 kwhr. per month	.025	per kwhr.

COOKING AND HEATING RATES

First	15 kwhr.	.05	per kwhr.
Next	185 kwhr.	.025	per kwhr.
Over	200 kwhr.	.01	per kwhr.

Up to December, 1935, the plant has generated 3,171,600 kwhr. with a maximum peak of 970 kwhr. Fuel oil used was 272,070 gals., showing a consumption of 11.6 kwhr. per gallon.

The month of December, 274,100 kwhr. were generated in comparison with 219,600 in December, 1934, a gain of 54,500 kwhr.

NEW ENGINE FILTER FOR DIESEL FUEL OIL

A FILTER designed for the purification of fuel oil used in Diesel engines is announced by Skinner Purifiers, Inc. This filter is new both in design and operation, employing the principle of Edge Filtration as used in the well-known Stream-Line Filter for lubricating oils in the Automotive, Diesel Engine, and Industrial fields generally.

The manufacturer claims many advantages for this Filter in addition to the high degree of purification effected, among which are, (1) positive removal of all contaminants in the oil, insuring perfectly pure fuel oil, and constant freedom from wear of injector pump parts, (2) no frequent inspection or replacement of the filtering element, (3) cleaning the Filter while the engine is in operation, (4) automatic operation.

The illustration of the Type F-3 Stream-Line Filter, and one of the filter packs graphically shows the means of purifying the fuel oil. The Fuel Transfer Pump Discharge is connected to the lower header shown, delivering oil at the required pressure into the filter-shell where it passes between, not through, the hundreds of specially prepared paper discs which compose the elements or filter packs.

The oil passes into a central hole of each pack, and is discharged into the Filter Head which is connected to the discharge line to the injector pump. The impurities which are removed in the filtering process collect at the surface of the packs, and do not penetrate into the pack, or between the discs. It will be appreciated how thoroughly the oil is purified by this method, in realizing that the maximum space

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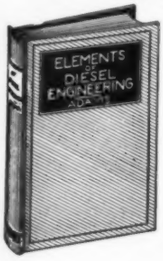

WRITTEN by a recognized authority on Diesel Engineering. The author is a man with a specialized education and with experience in training men for business and industrial work. In addition to writing extensively on Diesel Engines, Mr. Adams is the author of widely sold text books and has helped prepare important training courses on the subject of operation, care and repair of all types of modern Diesel power plants.

The increasing use of Diesel Engines in the automotive, marine, stationary and locomotive fields will require thousands of trained men during the next few years. The purpose of this new book is to help prepare men to enter this wide field for profitable and interesting employment. Many ambitious men are preparing themselves for the specialized and expert work in connection with the manufacture, sales and servicing of this prime mover.

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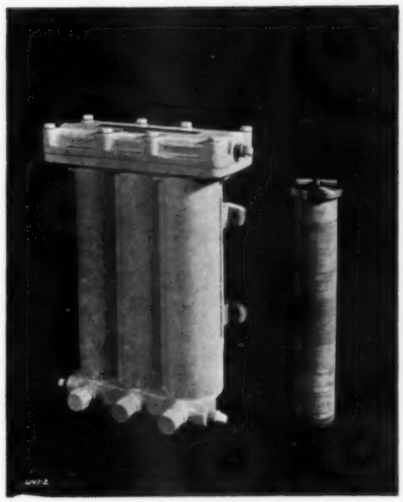
between the discs which compose the packs is less than 1/250,000th of an inch.

Operation of the Filter continues indefinitely until the percentage of impurities removed from the oil offers such resistance to normal flow as to retard capacity when the Filter is then cleaned. This is accomplished by opening, in turn, each of the three nuts on the bottom header. As the nut is partially unscrewed, the discharge from the Transfer Pump to that particular chamber is temporarily cut out of service, while the other two continue in operation. At the same time, the reverse pressure of oil in the filter head discharges clean oil back through the inside of the packs, washing the impurities from the surface. The cleaning operation requires only a few ounces of oil to remove all of the solid impurities, and which are drained into a small container, or on the ground. The Filter is then ready for service again, without having stopped the engine. It is not necessary to frequently clean the Filter, but the interval will be determined entirely by the amount of impurities which are removed.



Type F-3 Stream-Line Filter.

When furnished for Diesel engines now in service, the Filter is ready to connect to present lines to the injector, and is supplied with supporting lugs cast integral with the filter-shell. Approximate dimensions are: 6⅜" wide, 11¾" high, 2¼" front to back.

The Type F-3 Stream-Line Filter has been developed after exhaustive research into the necessity of removing *all* impurities from fuel oil, even when such impurities are microscopic or of the colloidal order, furnishing what is considered as the highest degree of purification commercially known for this type of service.

An example of this is reported in an extended test made in cooperation with a prominent manufacturer of injector pumps, wherein it was desired to prove that the successful purification of the fuel oil would eliminate wear upon the injector pump. After one hundred and fifteen million impulses of the injector, no wear was evident. This is considered equal to operating a Diesel engine for about one hundred thousand miles. No attention was given the Stream-Line Filter other than for cleaning purposes. Skinner Purifiers, Inc., will also market a lubricating oil filter.

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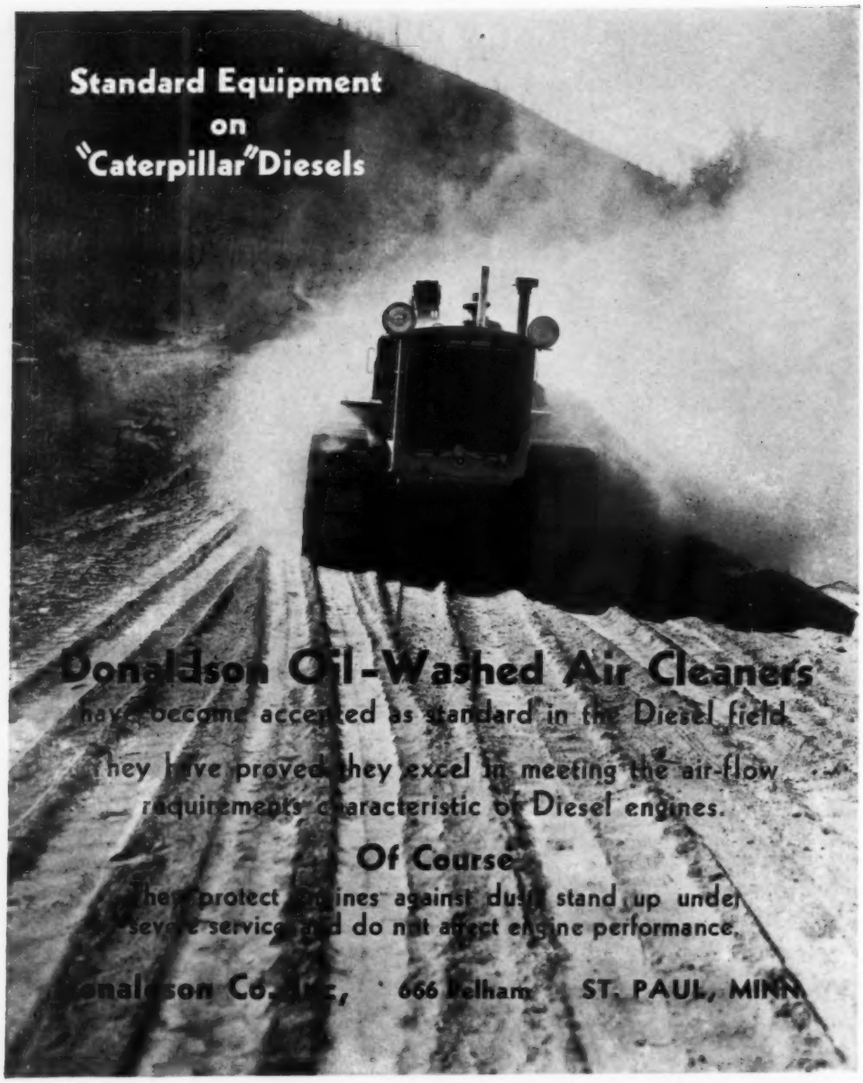
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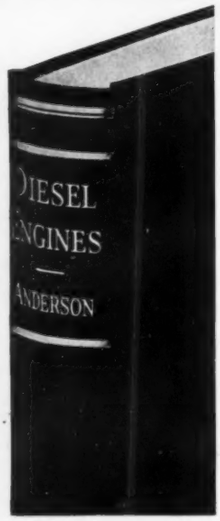

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What they are
What they can do
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How to install them
How to operate them efficiently
How to prevent troubles in operation
What performance may be expected from them
What operation costs should be

This book pictures the Diesel as it is today, shows typical constructions in common use, analyzes the designs, explains the reasons for the designs used, catches the trends of the developments, explains the essentials that go to make up the Diesel installation in its various applications, helps the user to know whether the Diesel is the answer to his power problem, and helps the user and operator get the performance and satisfaction from the Diesel that are justly due him.

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CITY OF DENVER

. . . . *Continued from page 32* . . . .

from the controls in the cab of the first car.

"In addition to the power cars each train will consist of three Pullman sleeping cars, a Pullman room and observation car, a dining car, two coaches equipped with adjustable and reclining seats, and three cars for baggage, mail and express. The new trains will incorporate every facility for comfort and safety which the Union Pacific has developed through its experience with streamline trains. The overall length of the trains will be 858 feet and the total weight about 600 tons. A conventional train of the same consist including locomotive weighs about 1,200 tons. The passenger capacity will be 82 in the Pullman cars and 100 in the coaches, or a total of 182.

"Externally these cars will be standard width but the interior by reason of the type of design will be five inches wider than present standard cars and of the same height. Capable of speeds in excess of 100 miles per hour the 16-hour operation schedule of the 'Streamliner — City of Denver' will require an average speed of 65½ miles per hour for the 1,048 miles between Chicago and Denver, including stops, and will be the fastest long-distance train schedule in America. No extra, or excess, fare is contemplated on the 'City of Denver.' Present plans indicate that service will be inaugurated early in June. The new low-cost individual-tray meal service, an innovation of the Union Pacific, will also be available on the new coaches in addition to the regular dining car service.

"Work on the Union Pacific Streamliners 'City of Los Angeles' and 'City of San Francisco' (in connection with the Southern Pacific), which will operate on a schedule of 39¾ hours, between Chicago and the two Pacific coast cities, is proceeding rapidly and these trains will go into service about April 15, 1936.

"The 'Streamliner — City of Portland,' which successfully inaugurated 39¾ hour service between Chicago and Portland and which was taken to the Pullman shops a short while ago for the installation of improvements developed from experience under actual operating conditions, will go back on its run within the next few weeks.

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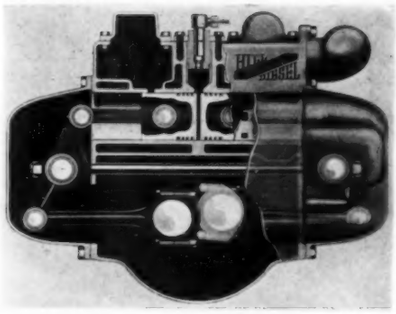


SOMETHING QUITE NEW

THE new Balanced Hill Diesel Engine which was exhibited for the first time at the New York Motor Boat Show, exemplifies an entirely different and novel development in engine construction. It is said that the Balanced Diesel, made by Hill, establishes a new high in the elimination of vibration, in simplicity of construction and in reduction of size and weight.

Linked with the announcement of this new development in Diesel power is the news that its designer is none other than R. E. Olds, long famous as a pioneer in the automobile industry. Mr. Olds, with a complete background of engineering research in the gas engine field, has been developing Diesels for more than fifteen years. In 1933 his research culminated in an idea which is revolutionary in Diesel design and which is summed up in the word, "Balanced."

The engine is of the horizontal cylinder, opposed piston type. Power is transmitted from the two pistons to a single crankshaft through an entirely new and greatly simplified arrangement. All reciprocating parts are perfectly balanced. All masses move in opposite directions at exactly the same rate of speed at all times. As a result the engine is inherently balanced and requires no mechanical means for the elimination of noise or vibration. It is said by the manufacturer that the Hill Balanced Diesel operates at normal speed with no perceptible vibration whatever, and with astonishing quietness.

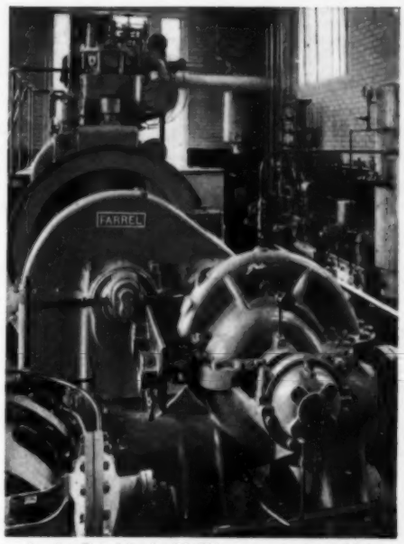
An adaption of the Hill combustion system is used which employs the Hill single orifice injection nozzle, the Hill precombustion chamber and the Bosch injection pump. Construction has been simplified to a point where the Hill Balanced Diesel includes approximately 250 less working parts than found in a conventional four cycle engine of the same horsepower. A Marine Propulsion Hill Balanced Diesel, complete with clutch and reverse gear, was dis-

FARREL SPEED INCREASERS SOLVE PUMPING PROBLEMS

Pumps, blowers and similar equipment that operate at speeds several times that of the driving engine or motor require a speed increasing unit to permit the use of the most efficient speed for both prime mover and driven unit.

Farrel-Sykes Speed Increasing Units are ideally suited for such applications. Many installations in oil pipe line pumping stations, water works, power houses and industrial plants have demonstrated their efficiency, reliability and ability to function for long periods with a minimum of attention and upkeep.

They are available in a complete range of sizes and any horsepower and speed combination. For full details send for Bulletin No. 425-A.



At the Pennichuck (N. H.) water works a high speed centrifugal pump driven by a Worthington Diesel engine through a Farrel-Sykes Speed Increasing Unit gives a pumping capacity of 6,000,000 gallons per day with a saving of 66 2/3% over the former steam pumping unit.

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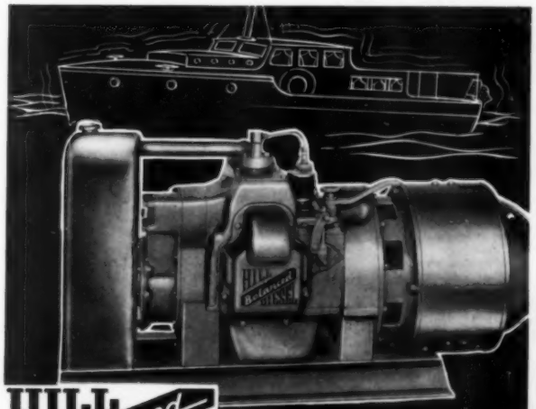

HILL Balanced DIESEL *Positively Eliminates* VIBRATION!

BALANCE—an entirely new development in Diesel construction definitely eliminates the old problem of vibration. You'll marvel at the smooth, quiet operation of this outfit.

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NEW HILL DIESEL

. . . . *Continued from page 43* . . . .

played at the Motor Boat Show. Its normal operating speed is 1,200 rpm. with a maximum speed of 2,000 rpm. The weight of the assembly including reverse gear is approximately 475 pounds and rated at 10 to 15 hp.

Also on exhibition was a small 5 kw. generator outfit. The Hill Balanced Diesel engine and generator are mounted together on a sub-base complete with radiator and fan. The weight of this unit is 800 pounds. Its normal operating speed is 1,200 rpm. The engine has a bore of 2½ inches and stroke of 3½ inches, and is the only model of this type now offered by the manufacturer. According to information received from the management, several larger sizes, upon which development work has been completed, will be offered in the near future.

Leaders in Diesel engineering have expressed keen interest in the new development which features the Hill Balanced engine. It is freely predicted that the public will welcome its improvements – the biggest major changes in the history of Diesel progress. An organization selected by Mr. R. E. Olds to carry on the production and distribution is headed by J. R. Tranter as general manager and F. E. Mengel as sales manager.

Interviewed by this magazine Mr. Tranter said, "We are keenly aware of our responsibility in getting this new type of Diesel Engine to consumers of power. Basic changes have been made in our production methods to enable us to keep up with demand for the operating benefits of the Balanced principle." Production is continuing on the present line of Hill Diesels and improvements have been incorporated in them which result in even greater dependability and economy. A six cylinder 5 x 7 marine model was also displayed at the show.

SUPERCHARGING

THE coming year will see some highly interesting developments within the industry from an engineering standpoint. When the history of engineering achievement for 1936 is written the word SUPERCHARGING will probably stand out head and shoulders above anything else. We have lagged behind Europe in the application of the principle of supercharging to Diesel engines, but in at least four engine shops right now strenuous efforts are being devoted to producing a line of supercharged four-cycle engines.

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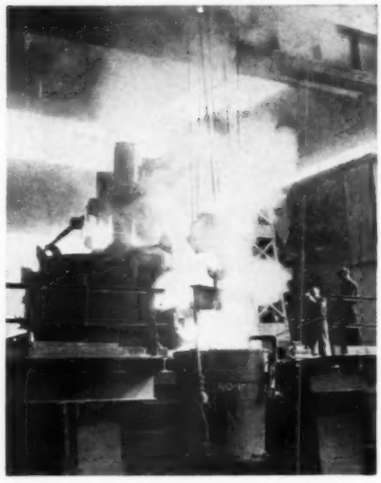

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Complete control of all processing from selection of the melting charge to the finished condition is National Forge and Ordnance Company's guarantee for maintenance of quality in crankshafts and various other types of forgings furnished to leading manufacturers in the Diesel industry.

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A LETTER

DIESEL PROGRESS
2 West 45th Street
New York City

The *Editor* of DIESEL PROGRESS:

As airplane designers and constructors, we do not qualify as experts in power plant development, but as airplane designers and constructors, we are qualified to hold and express opinions relative to our requirements in power plants. Such an expression was recently given publicity in connection with a proposed design for a 100,000 pound Trans-Atlantic flying boat.

In the larger types of aircraft, all present day designers are confronted with a serious decision in the selection of their power plants. Present American engines appear to be limited to approximately 1,000 hp. each, although future progress is of course inevitable. Larger boats require large total power. This could be obtained by increasing the number of present day engines installed, or by increasing the power developed by the individual unit. It is our opinion that four engines constitute the ideal number of power plants for large over-ocean transport equipment. The loss of one of four engines is essentially unnoticed and even two can go out and still permit the airplane to carry on to a point of safe landing. More than four engines tends to increase the complication to a point undesirable from the consideration of maintenance.

In the light of these opinions, it would now appear that we are limited to flying boats carrying a total of 4,000 hp. Our 100,000-pound project will require 6,000 hp. Hence, our need is for four 1,500 hp. engines.

The second need is for lower specific fuel consumptions, since long range flying boats must take-off with the full supply of gasoline needed for completing the trip with any reasonable expectation of adverse weather. Present gasoline engines are operating with approximately .45 lbs. per horsepower per hour specific fuel consumption and the forecast for the immediate future indicates a reduction in this fuel to approximately .40 or slightly lower. Diesel engines with specific fuel consumptions of .35 or lower are indeed attractive to the aviation industry for long non-stop flights. Several engine manufacturers both here and abroad have pursued their development along encouraging lines, but have not, to the best of my knowledge, produced equipment developing as much as 1,500 hp. per unit. Their progress, encouraging though it is, is being challenged by gasoline engine manufacturers through their success in higher revolutions per minute, higher brake mean effective pressures and higher anti-knock values in the fuels used. I am inclined to regard the progress of Diesel engines as seriously challenged along these lines and to feel that their industry and inventiveness will react favorably to this stimulant. Certainly the field of aerodynamic development has been a spur to gasoline power plant designers and if Diesel engines are to take their place as an essential element in the aviation field, the gasoline engine industry will form an effective spur to those scientists, inventors and practical designing engineers in the Diesel engine industry.

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GLENN L. MARTIN,
President.

Glenn L. Martin
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For filtering
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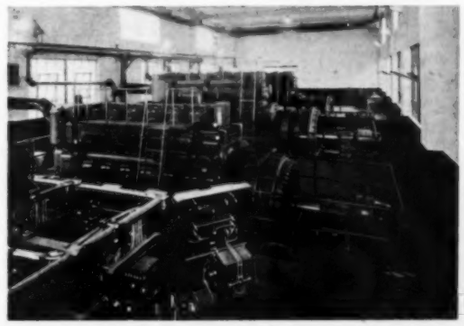

Nugent Duplex Fuel Oil Filters on the 3 Fairbanks-Morse Diesel Engines in the Oberlin Municipal Plant, Oberlin, Ohio

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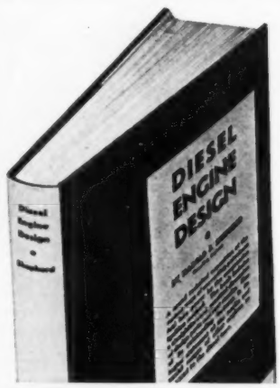

DIESEL ENGINE DESIGN

By HAROLD F. SHEPHERD

Consulting Engineer,
Member American Society of Mechanical Engineers

227 Pages, 6x9, $3.50

The only book in the English language which treats completely the design of all parts of the fuel injection apparatus and combustion chambers in Diesel engines—

TABLE OF CONTENTS

Chapter I —Historical
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Chapter III —The Influence of the Combustion-Chamber Walls
Chapter IV —The Fuel Nozzle
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Chapter VIII—Two-cycle Engines
Chapter IX —Injection of Gaseous Fuel
Chapter X —Bearings and Lubrication—Pistons and Piston Rings
Chapter XI —The Indicator Diagram
Chapter XII —The Inertia of Reciprocating Parts and Balancing
Chapter XIII—The Flywheel
Appendix

"DIESEL ENGINE DESIGN" will be indispensable to the engineer who needs a sound technical exposition of the various ways of converting petroleum fuel into power by the compression ignition method. The author, H. F. Shepherd, is an authority on the design and operation of Diesel engines. He has for many years been active in their development, and is the inventor of numerous special features and improvements well known to engineers in this field.

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2 WEST 45th ST. NEW YORK, N. Y.

NEW HAVEN R.R. BUYS DIESELS

THE New York, New Haven & Hartford Railroad has just ordered ten Diesel switching locomotives. The engines for five of these locomotives will be built by the Cooper Bessemer Corporation and the engines for the other five by Ingersoll Rand Company. The locomotives themselves will all be built by the General Electric Company at their Erie, Pennsylvania, works and all electrical machinery will be supplied by General Electric Company.

The application of the Diesel engine to railroad service thus receives further impetus by the placing of this order for ten 100-ton, 600 hp. Diesel electric locomotives. The New York, New Haven & Hartford Road will use these ten new units at various places on the road, retiring ten old steam jobs as a consequence.

The New York, New Haven & Hartford Road has had some experience with Diesels. The *Comet*, which runs daily between Boston and Providence and very successfully so, is equipped with a pair of Westinghouse Diesels, the train having been built by the Goodyear Zeppelin Corporation at Akron last summer.

It Extends the Economy of Diesel Operation

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IT ACTUALLY RE-REFINES—Fabriform Electrefiner does not just filter or reclaim used lubricants; it actually and literally re-refines, producing an oil as good or better than orginal specifications.

IT HAS A FILTER THAT DOES NOT GUM UP or require time of an operator to clean, and when operated according to instructions it is not affected by the pepper sludge peculiar to Diesel drainage.

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IT AUTOMATICALLY STEAM TREATS the oil at temperatures of 400° to 500° F. It is electrically operated and thermostatically controlled.

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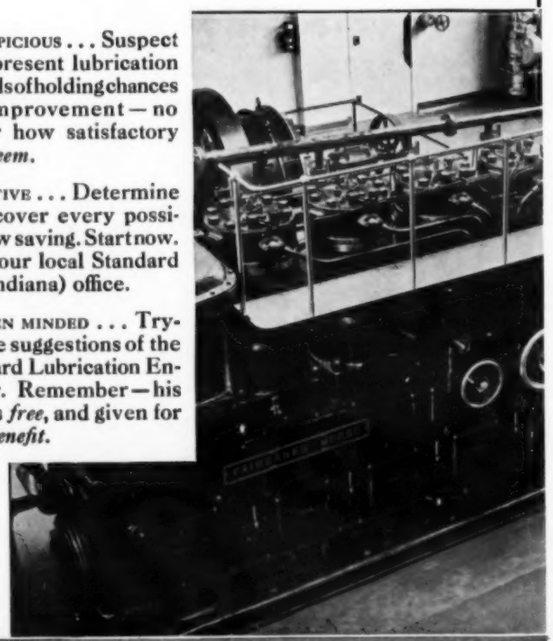
1421 So. Hill St., Los Angeles, Cal.

Formula for using the LUBRICATION ENGINEER

1 BE SUSPICIOUS . . . Suspect your present lubrication methods of holding chances for improvement—no matter how satisfactory they *seem*.

2 BE ACTIVE . . . Determine to uncover every possible new saving. Start now. Call your local Standard Oil (Indiana) office.

3 BE OPEN MINDED . . . Try out the suggestions of the Standard Lubrication Engineer. Remember—his help is *free*, and given for *your benefit*.



Apply this formula now, with personal initiative, for a full year of new savings in 1936. Others are applying it profitably every day.

STANDARD OIL COMPANY (INDIANA)

CORRECT LUBRICATION

YES, INDEED! Tooting a bit of modern high speed jazz, a good "hot" trombone player often shoots the slide back and forth 25 feet a second. With clearance of .003 inch this slide has to float on a perfect oil film. A little resistance or gumminess and there would be a sour note. Most of the trombone lubricant used is sold by the world's largest manufacturer of band instruments—and made with Standard Oil (Indiana) products.

★ ★ ★

Few lubrication problems are like this one. In fact most lubrication problems present their own individual differences. That is why the method of buying lubricants for industrial use has rapidly changed.

Today Standard Oil (Indiana) Engineers, *lubrication specialists*, can be called into any plant in 13 Middle-western states on a moment's notice. They check the operation of a machine or an entire plant, and recommend the most satisfactory and economical lubricants for each purpose. They bring valuable experience and information to men in the plant, and help to overcome careless and wasteful oiling methods. The plants they serve get effective, low-cost lubrication—not merely pounds of grease and barrels of oil—for their money.

★ ★ ★

One of these engineers recently ran a test on two Diesel engines in a flour mill—a test, using Nonpareil Diesel Oil, which resulted in a saving of $8.00 per 24-hour day.

★ ★ ★

Get to know the Lubrication Engineer more closely. Ask for the special monograph which explains what he can do for you and *how* he can do it: "The Lubrication Engineer—his Value to You." Also, listed below, is a growing library of other monographs discussing specific groups of lubrication problems, and giving practical advice. Send for any of these that interest you, and attach a list of any additional lubrication problems on which you wish help at this time.

STANDARD OIL COMPANY (Indiana) 251
910 S. Michigan Ave., Chicago, Ill.
Gentlemen: Kindly send copies of the paper checked to the undersigned. It is understood that no obligation is implied.

- ☐ "Steam Turbine Lubrication"
- ☐ "Steam Engine Lubrication"
- ☐ "Diesel Cylinder Lubrication"
- ☐ "Lubrication of Coal Handling Equipment"
- ☐ "Diesel Engine Air & Fuel Cleaning"
- ☐ "The Lubrication of Diesel Air Compressors"
- ☐ "Diesel Engine Bearing Lubrication"
- ☐ "The Lubrication Engineer—His Value to You"

Name.....
Position.....Company.....
Address.....
City.....State.....

Another F-M DIESEL Power Plant!

Three F-M Diesels totaling 700 hp. installed in the new Municipal Power Plant at Corning, Iowa.

ALL over Iowa tonight, the street lights and homes and stores will be calling for more power as darkness deepens. And F-M Diesels in a score of municipal plants will provide current in homes from the Mississippi to the western boundary of the state.

When Corning decided to switch to Diesel power and save the difference, it followed Indianola, Vinton, State Center, Clarion and a dozen other towns in which Fairbanks-Morse Diesels had proved their ability to save money. The citizens of Corning know *in advance* from the records of neighboring towns what they can expect in rate savings from the Fairbanks-Morse Diesels installed in their new municipal plant.

You, like the people of Corning, can find out how F-M Diesels can serve your plant . . . how they reduce operating costs . . . how they eliminate demand charges . . . how they turn old power costs into new savings. Just ask the man from Fairbanks-Morse. Or, write Department E81, Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 34 branches at your service throughout the United States.

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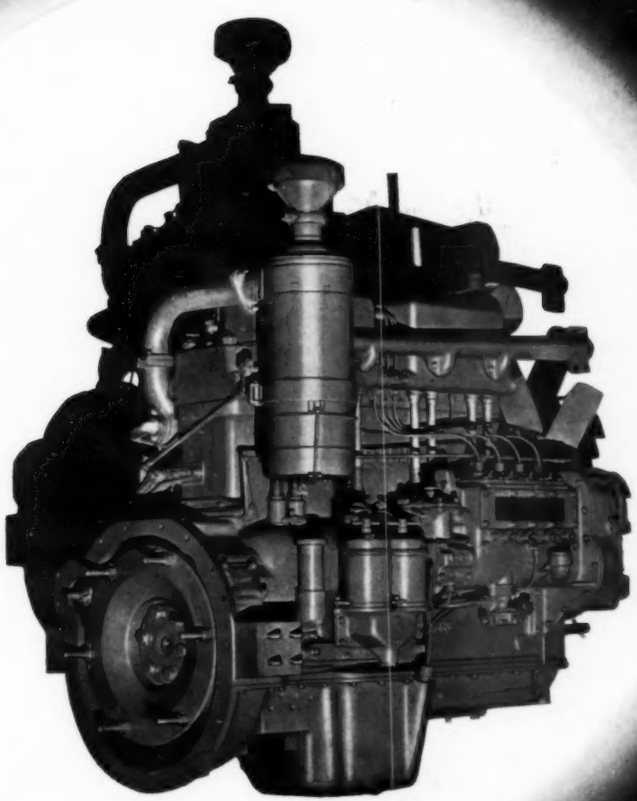

IN SAVINGS IN SERVICE IT'S FIRST!

Shaft power costs are slashed to a fraction . . . current charges are cut to around 1c per K. W. H. . . . that's what happens where "Caterpillar" Diesel power is installed. Because "Caterpillar" Diesel Engines and Power Units can bring these savings year after year in the face of long hours, heavy and varying loads, with a record minimum of operating costs, they are first choice for hundreds of power jobs. Ask your dealer about this power SHOW-DOWN. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

"Caterpillar" Diesel Engines (or complete Power Units) range from 47 to 160 maximum brake horsepower.

HARD FACTS ON THE SHOW-DOWN

"Caterpillar" Diesel power burns low-price Diesel fuels—and less fuel than gasoline engines.

A Colchester, Illinois, flour miller installed a "Caterpillar" Diesel Power Unit and reduced his power costs from 22.4 cents to 5.9 cents per barrel.

A Cartersville, Ga., cotton-gin operator reports: "My 'Caterpillar' Diesel gins at a power cost of 12c per bale—while 50c and 75c per bale are the costs of ginning by electricity and steam."

CATERPILLAR

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DIESEL

FIVE COOPER-BESSEMERS for the NEW HAVEN R.R.

LOUISIANA STATE
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TYPE-GN eight-cylinder Diesels—five of them—have been chosen by the New York, New Haven and Hartford Railroad to power five new 100-ton Diesel electric switching locomotives.

Advanced engineering design and a reputation for building well were factors influencing the decision. The electric equipment will be built by the General Electric Company.

The engines are to develop 660 H. P. each at 750 revolutions. They are the newer N-line engines, developed especially to meet railroad switching requirements. Their outstanding features are: through-bolt construction; T-type connecting rods; and patented atmospheric relief, constant pressure, injection system.

For any power requirement investigate Cooper-Bessemer Diesels. Sizes range from 55 to 1500 H. P.

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